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THE
GEOGRAPHICAL REVIEW

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THE WATER BARRIERS OF NEW YORK CITY

By ELLSWORTH HUNTINGTON

When the world was young men dreamed of the power of the gods. They dreamed that Jupiter could fly to the top of Olympus in the twinkling of an eye; Neptune could plunge beneath the water on the coast of Ithaca and emerge a few minutes later at the mouth of the Tiber; Pluto could cleave the ground asunder and descend to the depths of Hades. Today, man no longer dreams of these things. He does them. He flies in the air at the rate of two miles a minute; he plunges to the bottom of the sea and comes up miles away; he blasts the earth asunder and ransacks its deep places for hidden treasure. Where light-hearted Mercury occasionally lifted some happy mortal and winged with him across a broad river, the ordinary mortal can today shoot across a huge steel bridge in the wake of a snorting dragon.

Because we can do these things we flatter ourselves that we have conquered nature, but have we done it? Has not nature conquered us? Take the water as an example. Look at its effect on New York City. Because of the splendid harbor and the wonderful pathway up the Hudson-Mohawk Valley the city has grown beyond the wildest dreams of its founders. Today, if we include the part of the population on the Jersey shore, the real city is scarcely second to London in size and will soon rival or surpass the British capital. Never before in all history have so much gold, bonds, and other valuables been stored in a single metropolis. Never before was there a city which throbbed with so intense a life. All this depends on the fact that man has conquered the water and made it the highway of the nations.

But look at the other side of the shield. We have conquered the water, but what has been the price? How much does New York pay for the privilege of being located on Manhattan Island and thus having a fine harbor? Every one who comes to the city, together with a large portion of the people who dwell there, must frequently cross one or another of the narrow arms of the sea that surround the island on all sides. We conquer these narrow arms by steam ferries, great suspension bridges, and tunnels deep down in the mud and rock. Do we thus diminish the influence of the water barriers? How much did the barriers cost the average citizen of Manhattan in the

days when there were no ferries, bridges, and tunnels? And how much do they cost him today? If any man thinks that by our boasted cleverness we have lessened the influence even of such small bodies of water as the North River, the East River, and the petty little Harlem, let him count the cost in money, in time, in health, in character. Looked at in any way except as aids to commerce and as a stimulus to invention and activity these little bodies of water are today more of a hindrance than ever before.

New York City, as everyone knows, was founded on the southern end of Manhattan Island. The island is about 13 miles long with a width of about two miles at the south and one mile at the north. It is surrounded by narrow arms of the sea, wrongly called rivers, which are due to the depression and drowning of the coast in recent geological times. The widest arm is the North River, or main Hudson, one mile wide, which separates Manhattan from New Jersey on the west. The second arm, the East River, one-third to two-thirds of a mile wide, lies southeast of the island toward Brooklyn and Long Island. The little Harlem River, from 500 to 1,000 feet wide, completes the water barrier and separates Manhattan from the mainland on the east.

The ferries have always made trouble for New York. At the very beginning, according to I. N. Phelps Stokes in his book on "The Iconography of Manhattan Island," one of the conditions on which Governor Nicolls granted a patent to the town of New Harlem was that it should maintain a ferry to the mainland. The ferry was established across the Harlem River at Harlem, but thrifty travelers preferred to use the road by Spuyten Duyvil, for there where King's Bridge was afterwards built they could wade across. Traders finally brought so many horses and cattle across there that in 1668 the ferryman, apparently having little to do except sit and think of his wrongs, succeeded in persuading the inhabitants of New Harlem to join him in suing for redress of grievances. As a result the ferry was moved to the wading place, where at least it could carry across the people who did not want to join their animals in wading. The following year, 1669, a license was granted in New Jersey to Pieter Hetfelsen to run a ferry between Communipaw and New York. Thus the first formal steps were taken toward overcoming the water barriers of Manhattan.

In 1790, when the first census of the United States was taken, New York City had 33,000 people, and the modern metropolitan district had scarcely 50,000 people where today there are over 5,000,000. How much were the people of 1790 disturbed by the water barriers? Practically none crossed the water to their daily work. Those who crossed the rivers were chiefly the few travelers who passed through the city and the farmers who lived in Jersey or Brooklyn and came now and then in rowboats to sell produce and do a little buying. The largest ferry boats were mere scows. Although it is impossible to obtain figures as to how much the crossing of the water cost the community in 1790, we may be quite sure that for an entire year it was

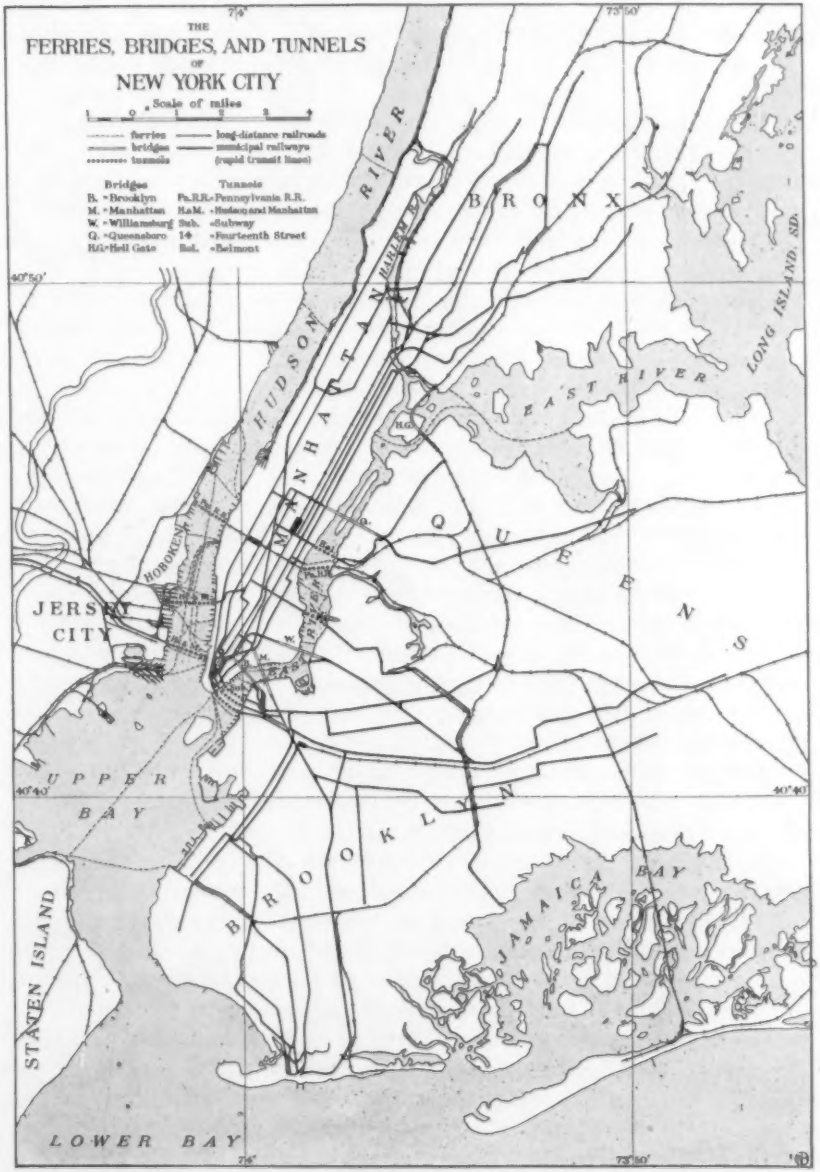

FIG. 1—Sketch-map showing how the water barriers of Manhattan Island have had to be overcome by means of ferries, bridges, and tunnels. Scale, 1:247,000.

only a matter of a few thousand dollars. The milkman may have had to drive a mile or two farther because Manhattan is long and slender, but it is doubtful whether the life of the ordinary New Yorker was appreciably influenced by the fact that he lived on an island rather than on the mainland.

Let us see what the water barriers are doing to New York today. As soon as lower Manhattan began to be densely populated there was trouble. The city was like a growing potato enclosed in a narrow tube. It wanted to expand in all directions, but the only line of growth was northward. Therefore the price of land rose rapidly, for many people wanted the same spot downtown. As Brooklyn and Jersey offered abundant land at prices much lower than in Manhattan, people began to live there and to cross the water to their work. Hence the ferries became important. Today they are a great source of expense not only to the people who use them, but to the municipality and hence to every New Yorker.

Let us estimate the annual expenditure entailed by the ferries. We may well begin with the municipal ferries, which run to South Brooklyn and Staten Island. They were taken over by the city in 1905 and have been operated ever since at a loss. The equipment of these ferries has cost not far from $12,000,000, including boats and especially terminals, which account for about 70 per cent of the cost. To this must be added more than $5,000,000 for the loss in operation from the time when the ferries were taken over by the government to the end of 1914. The interest on $17,000,000 at the rate paid by the city when the ferries were bought and equipped amounts to about $700,000. In 1913 the cost of operating and maintaining the Staten Island Ferry, together with depreciation, amounted to $1,110,000; while the South Brooklyn ferries cost $420,000. Adding together these various items we get a total of $2,230,000 as the cost of the ferries to the city in 1913. This sum paid the interest and carried 1,500,000 passengers to Brooklyn and 12,000,000 to Staten Island.

The municipal ferries are only a small part of those in New York. In 1906, when the last census report on transportation was issued, New York had 152 ferry boats, or 28 per cent of those in the entire country. Their value was $17,000,000, or 58 per cent of the country's total, while the number of passengers was 209,000,000, or 63 per cent of the ferry passengers carried in the United States. Since the building of the tunnels the number of passengers has decreased, but for the year ending in June, 1914, it amounted to 128,000,000 in addition to the 15,000,000 carried by the municipal ferries. The cost of the equipment has not diminished, and, as a result of the development of automobile traffic, more vehicles are carried than ever before. We have no figures as to the operating expenses of the privately owned ferries, but 128,000,000 passengers at the usual rate of three cents each would give $3,840,000 as the amount paid out by the public for this particular item.

Not only passengers but vehicles are carried by the ferries. In 1914 the Staten Island Ferry carried 342,560 vehicles at an average charge of 51 cents apiece, or 10 cents a mile. The revenue from this source was nearly 30 per cent as great as that from passengers. The 39th Street Ferry to Brooklyn, which is the other municipal ferry, carried 458,440 vehicles at an average cost of a trifle over 26 cents per trip, or 9 cents a mile. In this case the revenue from vehicles was three times as much as from passengers, for nowadays people use the bridges and tunnels. As the other ferries carry many more vehicles than the Staten Island Ferry in proportion to the passengers, but probably not so many as the 39th Street Ferry, we may fairly assume that the revenue from vehicles is at least as great as from passengers. Therefore we must add another $4,000,000 to the cost of the water barriers.

Even this does not complete the story. Every vehicle that crosses a ferry must waste at least fifteen minutes and usually half an hour or more if we include the necessary delays and the time lost in going out of the way to get to the ferry. If we count the average time lost on the municipal ferries as half an hour to South Brooklyn and three quarters to Staten Island, its value, on a basis to be stated later, is about $135,000 per year in one case, and $165,000 in the other, or about the same as the ferry charges. On the same basis the value of the time lost by all the vehicles on all the ferries is approximately $4,500,000 per year.

To get the total cost of the ferries we must add the cost of the municipal ferries, $2,230,000 per year; the fares paid by passengers on the other ferries, $3,840,000 per year; the fares paid by vehicles on the other ferries, about $4,000,000; and the value of the time lost by vehicles on all the ferries, about $4,500,000. This makes a total of approximately $14,500,000. Since part of this is based on estimates instead of exact figures we shall come nearer the truth if we say that the ferries cost New York from twelve to sixteen million dollars each year. So much for one item in the expense of the city's water barriers.

The more the New Yorkers have thought about their ferries, the less they have liked them. When one has time and the weather is good, the ferry trip is all right, but when one is in a hurry and it is stormy, some other way of getting across the water is pleasanter. Moreover, it is much cheaper not to have to transfer from one mode of conveyance to another. Therefore agitation for a bridge to Brooklyn was begun years ago. It finally took form in the Brooklyn Bridge, begun in 1872 and finished in 1883. Since then three other great bridges over the East River have been completed. A fifth, the Hell Gate Bridge, which will soon be open, does not cross from Manhattan to Long Island, but from the Bronx. As truly as the others, however, it is a means of overcoming New York's water barriers. With the exception of the bridge over the Firth of Forth in Scotland, New York has the four longest bridges in the world, their length varying from

6,000 to 7,500 feet while that of the Forth bridge is 8,100 feet. The New York bridges, too, have some of the longest spans in the world. Among suspension bridges the Manhattan, Brooklyn, and Williamsburg Bridges, with spans of 1,470, 1,595, and 1,600 feet respectively, are unrivaled. The Hell Gate Bridge, with a span of 995 feet, is the largest arch bridge in existence, the next being the Niagara Clifton Bridge with a span of 840 feet. Among cantilever bridges alone does the palm go elsewhere, for although the Queensboro Bridge has a span of 1,182 feet, it is much exceeded by the Firth of Forth Bridge, whose longest span is 1,710 feet, and the Quebec Bridge over the Saint Lawrence which is now being built with a span of 1,800 feet.[1] It is an astonishing fact that of the world's seven largest bridges five should be in the midst of the world's largest city.

Over the four East River bridges there pass each year six or seven million foot passengers. We will not include them in our estimate of the expense of the water barriers, for in most cases their walk probably does them good. A far larger army of about 120,000,000 people in 1913 and probably 130,000,000 in 1915 rides in surface cars, and about 115,000,000 in elevated trains. There is no way of estimating how much these people pay for transportation, since the fare for the bridges is not separated from the fare on dry land. We can get at the cost in another way, however. The number of round trips made by the surface cars was 3,660,000 in 1913 and close to 4,000,000 in 1915, while the number of round trips of elevated cars was 1,767,000 in 1913 and probably close to 2,000,000 now. The cost of running the surface cars is estimated by the Public Service Commission as about fifty cents for a round trip, while for elevated cars the expense is thirty cents. This means that the necessity of running the cars over the waste space of the four East River bridges costs the transportation companies $2,600,000 a year, which means that it must cost the public not far from $3,000,000.

Large as this sum seems, it is only a beginning. Think how much it costs to drive more than 8,000,000 vehicles across the East River bridges each year. An actual count shows that in a single day in October the four bridges were crossed by something like 7,500 one-horse vehicles, 5,000 two-horse vehicles, 500 three-horse vehicles, and 12,000 motor vehicles. All these vehicles drive much unnecessary distance in crossing the bridges, and in reaching them. Suppose that each one-horse vehicle, including horse, driver, and equipage, is worth $4.00 for an eight-hour day. Such a vehicle may be supposed, on the average, to go at least half a mile out of its way in order to reach a bridge and a mile and a half in order to cross it. That will take half an hour at a moderate estimate, and the cost will be about $675,000 per year. Suppose that the two-horse vehicles, with their drivers, are worth $5.00 a day. As they go slowly, they will not average more than a mile in twenty minutes, and the value of the time which they spend in getting to

[1] For these figures I am indebted to the engineering firm of Lindenthal, New York City.

the bridges and crossing them will be about $800,000. We may suppose that the three-horse vehicles are worth $6.00 a day, which is a decidedly small figure. It will cost them $80,000. Finally, the various types of automobile vehicles may be assumed to be worth at least $10.00 per day. Although they will go faster than the horse vehicles they are subject to such frequent delays that it is safe to say that the average time lost on the bridges is at least ten minutes and probably more. If it is only ten minutes the value of the time thus consumed amounts to not far from $900,000. Thus the long string of vehicles that continually promenades across the bridges, year after year, from early morning until late at night, is obliged to waste time worth about $2,455,000 each year. Since there are a considerable number of other vehicles, such as push carts, not to mention horses that are led across, the total cost of the time lost is at least $2,500,000. This is item number two for the East River bridges.

The third item is maintenance. In 1913, the last year for which reports have been published, the cost of maintaining the four great bridges was about $720,000. To this should be added depreciation, which would be about $580,000 if we estimate the life of the bridges as one hundred years. Finally, the last item in the indictment against the East River is the actual cost of the bridges themselves. The cost of construction was $58,000,000, and that of the land for their approaches about $32,000,000, making a total of $90,000,000. The interest on this at 4½ per cent, which is what the city generally paid at the time when the bridges were built, is $4,050,000. To all this must be added the fact that the mere business of administering the bridges involves an expense of about $120,000 for salaries, offices, and the like.

Here, then, is the annual cost of the four great bridges:—for operating the cars, $2,600,000; for time wasted by vehicles, $2,500,000; for maintenance and repairs, $720,000; for depreciation, $580,000; for interest, $4,050,000; and for administration, $120,000; making a total of $10,570,000.

Not even yet are we through with the bridges. Thus far we have been talking only about the four already completed between Manhattan and Long Island. The fifth, the Hell Gate Bridge, is nearing completion. Its estimated cost, including approaches, is $25,000,000, and it will doubtless add nearly one-fourth to the sum just stated as the total.

New York has also many other bridges. There are at least eight wagon bridges in addition to several railroad bridges over the Harlem River, while in other parts of the city numerous minor bridges cross little bodies of water of no special importance. In 1913 the maintenance of all the bridges, aside from those over the East River, cost $490,000. Their capital cost, including land, was about $31,000,000, which means an interest charge of approximately $1,400,000. There are no figures as to the traffic over these bridges. We may attempt to estimate this by figuring that the traffic per square foot of *area* rather than per foot of *length* is as great on these bridges as on the

East River bridges. Of course many are narrow, so that in proportion to their area they are not nearly so important as in proportion to their length. On this basis the cost of the time lost by vehicles would be about $1,400,000, while the cost of running cars and trains on the bridges would be about $1,500,000. Depreciation on the basis of one hundred years of life for each bridge would be $170,000. Adding these figures we get $4,960,000 for the minor bridges. With the East River bridges this makes the enormous total of $15,530,000 for the bridges actually in operation, while the new Hell Gate Bridge will bring the total not far from $18,000,000. This, it must be remembered, is what the bridges cost the city each year.

Ferries and bridges are only two of the great items in the cost of the water barriers. The third, and probably eventually the greatest, is the tunnels. Thus far New York has seven sets of tunnels in operation. Each consists of two parallel tubes. Three of the tunnels pass under the main Hudson to New Jersey, and four under the East River to Long Island. Although one of the two Hudson and Manhattan tunnels to New Jersey was begun in 1874, it was not opened till 1908. The other Hudson and Manhattan tunnel was opened the next year, while the third Jersey tunnel, that of the Pennsylvania Railroad, was completed in 1910. The East River tunnels are even more recent. The Battery tunnel connecting the Subway with Brooklyn and the Belmont tunnel at 42nd Street were indeed finished in 1908, and the Pennsylvania tunnel in 1910, but the Queensboro tunnel was not opened till 1915, and there are still four more tunnels to be completed to Long Island. It is almost impossible to determine the precise cost of all these tunnels.[2] The Hudson and Manhattan system cost

[2] The following letter, which was kindly sent me by Mr. T. H. Whitney, Secretary of the Public Service Commission for the New York City District, gives some interesting facts about the later tunnels and also illustrates the difficulties of estimating the cost of the tunnels:—

Since the receipt of your letter of January 8, inquiring for cost data upon the river tunnel sections of our rapid transit railroads, I have been endeavoring to get such information. I find, however, that it is impossible to segregate the figures. The best I can do, therefore, is to give you an approximation.

The existing Battery tunnel of the first Subway was constructed under Contract No. 2, which embraced the Subway from City Hall, Manhattan, south through Broadway to Bowling Green and thence to and under the East River to Joralemon Street, Brooklyn, and thence to the present terminus of the Subway at Atlantic and Flatbush Avenues. While this work was done for the city upon a bid of $3,000,000, its cost was very much greater, and I have seen it stated that the total cost of the Brooklyn extension was in the neighborhood of $10,000,000. Just what proportion of this was spent upon the tunnel proper would require an examination of the construction company's books.

This Commission recently has awarded contracts for three new tunnels under the East River together with approaches on either side, and I can give you the total contract prices, but as none of them is near completion it is impossible to estimate what the cost of extras or additions may be. These tunnels are as follows:

For New York Municipal Railway Corporation, Whitehall Street, Manhattan, to Montague Street, Brooklyn, $5,974,809.50;

For Interborough Rapid Transit Company, Old Slip, Manhattan, to Clark Street, Brooklyn, $6,469,916.25;

For New York Municipal Railway Corporation, 14th Street, Manhattan, to North 7th Street, Brooklyn, $6,639,023.50.

The Commission has yet to award another tunnel under the East River, running from 60th Street, Manhattan, to North Jane Street, Long Island City, but bids for this work have not yet been invited.

Somewhat more complete information is available for the Steinway Tunnel, now known as the Queensboro Subway, which, under the Dual System contracts, was purchased by the city in uncompleted

about $55,000,000, and the cost of all the tunnels is sometimes given as close to $200,000,000. As these figures include a certain amount of subway construction on land as well as under water they are too high. An approximation, however, may be reached in another way. In 1914 about 60,000,000 people went through the Hudson and Manhattan tunnels; 27,000,000 of these paid seven-cent fares, and the rest five. The total passenger fares received by the Hudson and Manhattan Company amounted to $3,500,000 that year. If we make allowance for the fact that a part of this sum was paid for land transportation, the cost of passing under the river must be close to $3,000,000.

For the other tunnels no figures are available. If they necessitate as great expenditures in proportion to their capital cost as do the Hudson and Manhattan tunnels, the total for all tunnels cannot be much less than $10,000,000 each year and may be more.

With a cost of $14,500,000 for ferries, $15,530,000 for bridges, and $10,000,000 for tunnels we find that the people of New York are paying close to $40,000,000 each year to get across their water barriers. Even this, however, by no means ends the matter. Many people not only pay to go through the tunnels but pay two land fares to get home where they would pay only one if there were no water. How many such people there are we cannot even guess, but they must annually spend several million dollars that would be unnecessary if the Brooklyn and Jersey systems of transportation were a unit with those of Manhattan. It is therefore conservative to say that the people of New York are spending $40,000,000 a year to get themselves and their vehicles from one side of the rivers to the other.

Thus far we have not considered freight traffic except as it is carried by vehicles. Every pound of raw materials, food, or manufactured goods that comes to Manhattan or goes out must cross the water. Each crossing costs something. No figures are available, but the total is certainly enormous. Go out on the North or East Rivers any day and watch the train-ferries loaded with freight cars. See how they thread their way far up the East River to reach the tracks of the New York, New Haven, and Hartford Railroad. A single item will illustrate the matter. A few years ago the

condition for $3,000,000. The owners claimed to have expended upon it $7,730,000 in excess of the $3,000,000 allowed. The city since that time has spent several hundred thousand dollars additional for construction and equipment of this line. It was opened for operation June 22, 1915, and the revenue and operating expenses for the quarter ending September 30, 1915, were:

Revenue	$22,322.00
Operating expenses and taxes	16,008.00
Maintenance of way and structure (included in operating expenses)	7,663.00

As the revenue comes almost entirely from passenger fares at five cents each, representing a one-way movement, and as an equal number of passengers are carried in the opposite direction on free transfers, the total number of passengers carried would be approximately forty times the revenue.

As to the Battery tunnel of the existing Subway, the number of passengers carried through it is indicated by the number of tickets sold at the Brooklyn stations, which was approximately 44,000,000 for the year. As this represents the westbound movement through the tunnel, it may be assumed that approximately the same traffic was carried through the eastbound tunnel.

The cost of operation and maintenance of this tunnel is not segregated in the reports. To make even an approximate segregation would require access to the operating company's payrolls and vouchers.

boat that was accustomed to carry the "Federal Express," the through train between Boston and Washington, was condemned. It was not worth while to buy a new boat, since the Hell Gate Bridge will in a few years permit the New Haven trains to cross to Long Island and there enter the Pennsylvania tunnels and so reach the Pennsylvania Station and the Jersey tunnels. Therefore the Boston-Washington trains do not now pass over the main line between New Haven and Trenton, but make a circuit northward to cross the bridge over the Hudson at Poughkeepsie. This involves a detour of 90 or 100 miles over a poor road. According to the Interstate Commerce Commission the average cost per train-mile on the New Haven road is $1.73. Hence the cost of getting one train a day each way around New York and its waters amounts to at least $120,000 per year.

Other items might be added. For instance about 20,000,000 tons of shipping pass through the Harlem River each year. The cost of opening the drawbridges for the ships has already been included in the cost of maintaining the bridges, but we have not reckoned the delays. At present the draws are open only seven hours a day, which causes not only great congestion but exasperating delays to ships. If the draws were open longer, however, the land traffic would be greatly hindered, which would be still worse. This particular matter does not enter into our calculations because it is a hindrance to water traffic and not to that by land. The question is interesting because it illustrates how land and water traffic interfere with one another.

Taking into account only the hindrances to land traffic, but including passengers, vehicles, and railroad trains, it seems safe to say that our figure of $40,000,000 per year for passengers and vehicles must be raised to $50,000,000 to include freight. In other words the water barriers of Manhattan involve an expenditure of about $10 per year for every man, woman, and child in the city. Think what it means that for an ordinary family in New York there is an outlay of fifty dollars per year simply because the coast of the eastern United States has been depressed a few feet. To be sure, this depression is what has made New York harbor, and the harbor is an enormous source of wealth to the city. An equally good harbor would have been possible, however, without separating the people of metropolitan New York into Manhattan, Long Island, New Jersey, Staten Island, and the New York mainland. One could easily plan the distribution of land and water in such a way that the accommodations for shipping would be practically as good as now, while the hindrance to land traffic would be greatly reduced.

Even yet we are not at the end of the matter. When the New Yorkers found that there was not room enough for them on the ground, they began to try to find room above and below. More than anyone else they have tried to find "a place in the sun," and they have done it by climbing upward. Sky-scrapers are such an everyday thing that people fail to realize that they

are a highly peculiar type of architecture which has developed within the last twenty-five years. Like metropolitan tunnels and huge bridges, they are a recent and novel invention. No longer ago than 1889 a nine-story office building in New York was considered remarkable, and there were none so high in any other city. Today New York alone has more than two hundred buildings over fourteen stories high, while three have at least forty stories and rise to heights of about seven hundred feet. Millions of people in the United States have never seen a hill seven hundred feet high. Perhaps the majority of New Yorkers have never seen a natural hill as high as their own highest buildings. In many parts of the country a hill as high as the Woolworth Building, 792 feet, would be called a mountain.

The evolution of the sky-scraper is the direct result of the water barriers of Manhattan. The lower end of the island is so small that it cannot accommodate half the business that would gladly go there. Hence it was natural to attempt to get more space by building higher. The Equitable Building stands upon an acre of ground but has over forty acres of floor space, thirty-eight stories above ground, and three below. New York is so large and influential that its example has carried the sky-scraper all over the country, a fact which is much to be regretted. In huge cities such as Chicago, or still more Boston, which resembles New York in being impeded by water barriers, the sky-scraper may be a necessity. Elsewhere it is usually a mistake. It commonly forms a blot on the landscape, where it rises in ugly squareness amid a host of smaller buildings, and its presence leads to congestion where no such thing is necessary. Only in New York has it become really a thing of beauty. There the number is sufficient to give the effect of a solid mass when seen from the water. Certain individual buildings are objects of high architectural beauty. In future days, when man has learned more about the art of transportation and when he no longer crowds himself into a tight corner where everyone jostles his neighbor, the world will perhaps look upon the finest sky-scrapers much as we now look upon the pyramids of Egypt,—wonderful structures, even beautiful, but not a model for the future.

The sky-scraper was originally due to the excessive value of the land in lower New York. Yet its presence has actually lowered the value in some places. The dark lower stories of sky-scrapers themselves, as well as the low buildings shaded by them, do not rent so well as they did when the new type of building was first introduced. In spite of this the rents in practically all parts of New York are excessive, and the price of land is almost fabulous. Every one who lives in the city is paying a higher rent than would be necessary if the city were built upon the mainland instead of an island. Consider what it means when a square foot of land is worth $583. That is the highest price ever paid in New York or in the world. The next highest is $360 in Pittsburgh, $339.50 in London, and $325 in Boston. The desk at which the writer is now sitting measures 32 by 50 inches, or a little over 11 square feet.

FIG. 2—The sky-scrapers of downtown New York. The development of the sky-scraper is due largely to the restricted area available because of the island-nature of the city.

If it were land in Wall Street it would be worth about $6,500. If it yielded an income of 6 per cent a piece of land the size of two such desks would support an ordinary working-man's family in more comfort than is usually the case. The average farmer in the United States has a hundred acres of land and obtains an income less than would be derived from a piece the size of two desks in New York. If he owned one hundred acres in lower New York and it were worth $250 per square foot, he would have an income of $6,000,000. Let there be no misunderstanding: the *income* from a piece of land no larger than an average farm but located around Wall Street would be about six million dollars a year.

This gives an idea of what vast sums New York is paying for rent. The mere fact that it is a large city causes the land to be enormously valuable, but in London, with more people than New York, there is no such inflation of values. The difference is due to the water barriers. How much it may be, no one can tell, but probably the extra rent due to the water barriers is even greater than the amount paid for transportation across them. If this is so, the fact that Manhattan is an island costs the average family in New York at least $100 a year, and possibly more. Only an extremely rich city could stand such a strain.

It might seem as if at last we had reached the end of the indictment of the water barriers. But there is one more phase of the matter. The congestion in lower New York is tremendous. Every day over 750,000 people swarm into the region below 23rd Street by subway, tube, bridge, and ferry, and still others by surface cars and on foot. Such crowding has a bad effect on both health and character. When 15,000 people pour out of a single building in an hour, and when hundreds of thousands pour from other buildings within a space of a few hundred acres, the congestion is enormous. Go down to a subway station between five and six o'clock at night, when the working day is over, and see how the people crowd and jam; go to an elevated station and watch them push for places. Watch them hang from the straps in the cars; watch the interminable line of cars across Brooklyn Bridge. Consider how many people have been rudely crowded and shoved during that one hour; how many tired girls are standing when they ought to be sitting; how many are roughly pushed until they almost fall. How many people of every kind have suffered a nervous shock because of the daily rush; how many have taken cold or become sick, because they have been overtired and have breathed polluted air while wearily hanging to a strap and swinging and jolting from side to side. Because of such conditions how many are today less efficient than they might have been? How many have yielded to temptation in one form or another simply because the nervous wear and tear of the terrible congestion of lower New York have decreased their vitality? All these are things that we must take into account if we would know what the water barriers are doing to the great American metropolis.

In one sense such congestion is found in every city, but because New York is on an island it is greatly exaggerated there. As we look at the effect of New York's water barriers on the cost of living, on architecture, on rents, on problems of transportation, on health, on morals, can we say that man has overcome his physical environment? By our attempts to overcome it, have we not made ourselves a hundred times more subject to it? In the old days of New York when there were 30,000 people, did a single one ever lose his health or suffer nervous breakdown because the water barriers added to the strain of life? A small part of the population was put to extra expense when they traveled, and all had to pay a little more for food because it had to be brought across the rivers. That was the total effect. Today there is not a person in the city who is not directly and deeply influenced by the ferries, bridges, and tunnels, by the high rents, or by the congestion and crowding. The toll now taken by the water barriers is measured in hundreds of millions of dollars and thousands of human characters each year. We may have conquered nature, but in the struggle she has bound us as tightly as we have bound her.

If we would realize how completely modern man is under the influence of his physical surroundings, consider how much more harm a convulsion of nature would do now than ever before. Suppose an earthquake no worse than hundreds that have occurred in other places should shake down New York's bridges and ferry terminals and should open cracks by which the water could flow into the tunnels. What would happen to the city? The starvation, misery, and death that would follow can scarcely be pictured. Hundreds of thousands, if not millions of people would no longer be able to carry on their daily work or procure food.

It is true that such a calamity is not likely to happen because New York is not in a region subject to earthquakes. There is another and much worse calamity, however, which is more likely to overtake us. The nations that were great two thousand or more years ago have all fallen to a low estate with the single exception of Italy, and it has had its Dark Ages. Take Mesopotamia as an example. Because the people neglected their canals or lost the skill and energy to care for them or because they could not ward off enemies, the Euphrates and Tigris Rivers broke loose, the canals were ruined, and the Garden of Eden became no better than a desert. The people of Mesopotamia had conquered nature to a far larger extent than had the Arabs to the south of them or the Kurds to the north. Hence when they lost control their fall was correspondingly great. In their day of power they thought that their dominion would last forever. They failed to discover the causes that were undermining their strength, and their civilization perished from the face of the earth.

Today we are in our hour of greatness. What will happen to us tomorrow? Suppose that luxury, vice, self-seeking, disregard for high ideals, and all the other evils of a decadent nation come upon us. The seeds are

here. What if they should grow? Then our control of nature would be lost. Our bridges, poorly repaired by corrupt and inefficient spoilsmen, would fall; our tunnels would begin to leak; our great buildings would one by one collapse. These things could easily happen in a few centuries if once our grip on nature and on ourselves should relax. The only way that we can permanently retain the mastery of nature is by building up human character. Formerly men thought that religion, education, and training were the chief means to this end. In recent generations we have learned that proper food, clothing and houses, abundant fresh air, and freedom from disease also play a highly important rôle in the process. Today we are at last coming to a realization that only by weeding out the weak-bodied, weak-willed parts of the community through some form of eugenic selection, and by seeing that people are adjusted to their physical environment, can we provide proper human material for the great tasks of civilization. We can scarcely avoid the conclusion that the building up of character is as much the work of the scientist as of the preacher, teacher, or philanthropist. Our dependence upon nature, as is shown by the water barriers of New York, is increasing by leaps and bounds. In spite of the constantly growing price that he must pay, man is still master. His mastery, however, depends upon the preservation of his energy, vigilance, industry, inventiveness, honesty, and other high traits of character. Our constantly growing dependence upon nature makes it more necessary than ever before that science should play its part in preserving those traits which alone can render man permanently victorious over his geographical environment.[3]

[3] For a valuable discussion of City crowding and the interrelations of offices, residences, slums, and factories see the section on congestion in "The Cost of Competition" by S. A. Reeve, Doubleday, Page & Co., Garden City, N. Y., 1906, pp. 285-293.

SOME GEOGRAPHIC PROBLEMS INCIDENT TO THE GROWTH OF NEW YORK CITY*

By E. P. GOODRICH
Consulting Engineer

Among the items which a municipal engineer meets in his professional work and which are related to geography are the making of maps of differ-

FIG. 1—Map of New York City prepared in 1900 for exhibition at the Paris Exposition. The scale of the original is 1,800 feet to 1 inch, or 1:21,600; there is also an edition on half the scale, 1:43,200. Its special value lies in its representation of relief (in contours) and the built-up area.

ent kinds such as those which show the streets, waterways, and railroads, and the distribution of population and of traffic, both present and prospec-

* Read at the third joint meeting of the Association of American Geographers and the American Geographical Society, April 14 and 15, 1916.

tive; the computation of population data and related demographic phenomena and their reduction to diagrammatic form, such as population curves, past and future; the preparation of street railroad passenger diagrams, train operation diagrams, the water consumption curve, past and future, and traffic congestion diagrams; together with the collection and analysis of the data necessary to a proper study of each subject.

FIG. 2—The official map of New York City published in 1915. The scale of the original is 2,000 feet to 1 inch, or 1:24,000. This map shows the theoretical street system. Only a relatively small proportion of the streets shown are physically open in most of the boroughs.

An interesting example of cartography is found in the 1900 map of New York City (Fig. 1) prepared by the Topographical Bureau of the Board of Public Improvements, Mr. Louis A. Risse, Chief Topographical Engineer, for exhibition at the Paris Exposition. Although it is marred by a more or less imaginary treatment of proposed streets and parks in the outlying dis-

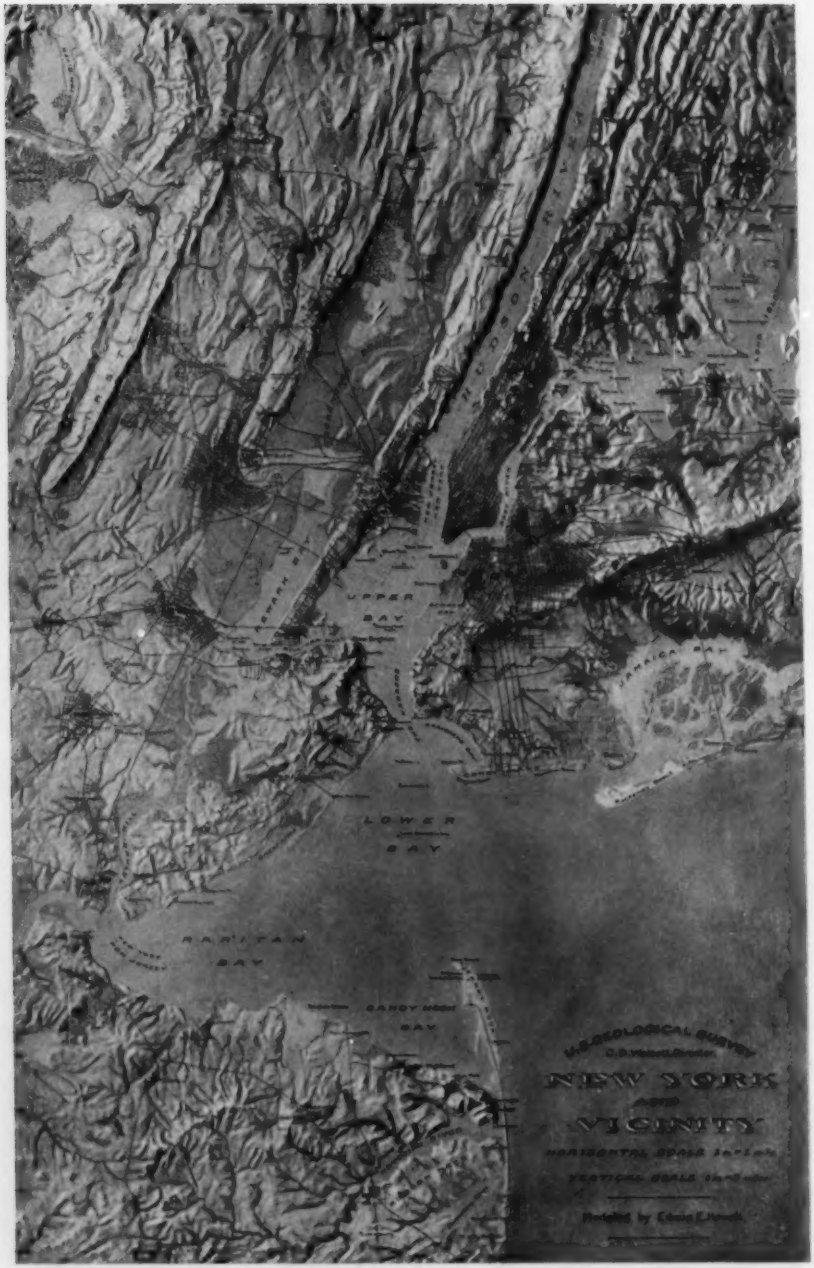

FIG. 3—Photograph of a relief model of New York City and vicinity. A study of this model in comparison with Figure 2 shows the present development in contradistinction to the theoretical street system. The model also shows how topographical features have guided and limited this development. (Courtesy of Howell's Microcosm.)

tricts, the map is of great value to the geographer because it represents relief (by contours) and the built-up area—elements rarely available on a city map and the latter generally only on detailed insurance atlases.

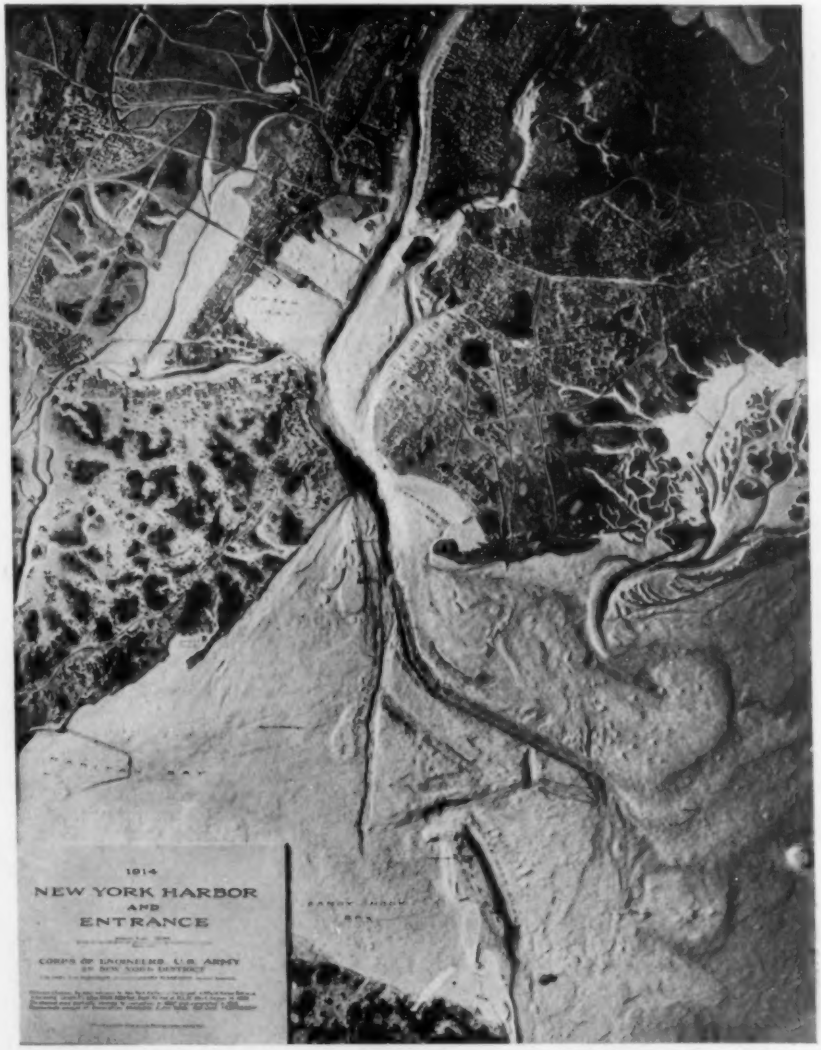

FIG. 4—Photograph of a relief model of the submarine topography of New York Harbor. It shows the artificial channels dredged to give entrance to New York Bay, and how and where the natural channels exist.

The 1915 map of New York City (Fig. 2), prepared by the Bureau of Public Works of the Board of Estimate and Apportionment, Mr. Nelson P.

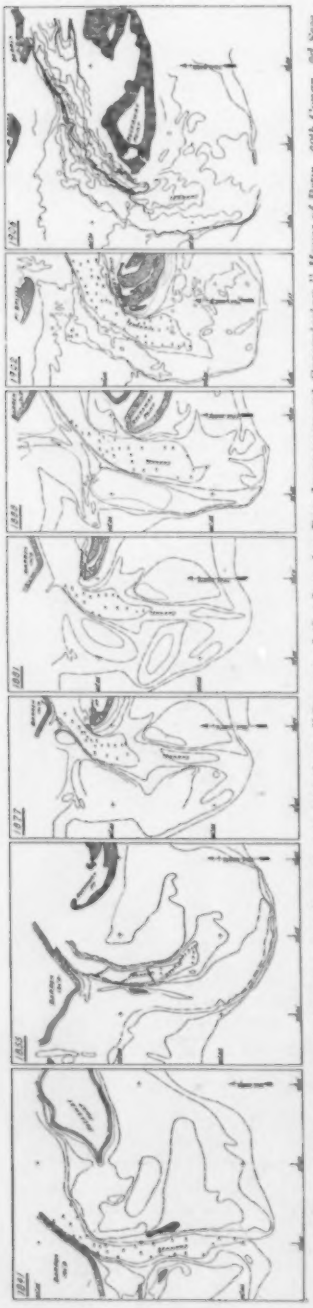

FIG. 5—Maps of the entrance to Jamaica Bay from 1841 to 1906, from "Report of the Jamaica Bay Improvement Commission," *House of Repr., 60th Congr., 2d Sess., Doc. 1506*, Washington, 1909. A comparison of these maps, one with another, will show how the point at the entrance has moved progressively westward due to the drift of the beach sand.

Lewis, Chief Engineer, is a map which complies with the requirements of the City Charter in showing all streets whether actually paved, or only graded, or only staked out on the ground so lots can be sold, or only projected by the land owners and about which proper formalities have been complied with in the way of signing certain documents. In most of the outlying districts a traveler could negotiate the majority of the streets shown only on foot. The map was made after long and laborious triangulations and traverses, and a most carefully referenced system of co-ordinates has been established with monuments properly located in the field, all with an accuracy of at least 1 in 100,000.

A comparison of that map with a photograph of Howell's relief model (Fig. 3) will show at the same time the deficiencies inhering in a legal city map. On the model only those streets have been indicated which physically exist, together with a representation of the surface topography. A map of this kind is specially serviceable in studying problems of transportation, sewerage, population distribution, etc., because it shows in a comprehensive way the barriers to traffic and population growth, such as the ridges and valleys which alternate parallel with the Hudson River in the northern part of the city.

A model of a similar kind, which shows the underwater topography of New York Harbor (Fig. 4) is also of interest. It shows the submarine river channels, among other things, and also the effect which human effort has had in modifying natural causes in connection with the new direct artificial

FIG. 6—Map showing existing and proposed docks and terminals in New York City. A comparison of this map with Figure 3 will indicate where it is impossible to develop more docks because of topographical limitations. (Courtesy of the Committee on the City Plan of the City of New York.)

FIG. 7—Balloon photograph of the major portion of the Bush Terminal, Brooklyn (for location, see Fig. 6), showing the piers one-quarter of a mile long in the foreground, warehouses in the right background, and the tenant factory buildings in the left background. (Courtesy of the Bush Terminal Co.)

FIG. 8—Balloon photograph of a portion of the Bush Terminal showing the railroad yard in the center, concrete and brick multi-storied warehouses for miscellaneous merchandise on the left, one-storied warehouses for fibers (cotton, jute, sisal, etc.) in the right foreground, and the tenant factory buildings in the right background. (Courtesy of the Bush Terminal Co.)

channel between the inner harbor and the ocean. The fact that this artificial channel has apparently become self-sustaining will be watched with interest by harbor engineers and studied in connection with the phenomena of shore erosion and shift of channel which has evidently continued for centuries

FIG. 9—Map of Newark, N. J., showing the distribution of population. The distribution of the residential population as given on the insurance maps is indicated graphically by dots. Each dot represents 25 people. The congested sections are shown very clearly by the density of the dots. Note the room for expansion to the north, south, and west, where dots are less numerous. (Courtesy of the Newark City Plan Commission.)

and which is now in process at the mouth of Jamaica Bay, for example (see Fig. 5).

A harbor map which shows the present development (such as Fig. 6), when compared with a topographical relief map, indicates what a relatively small portion of New York City's waterfront has been actually and efficiently developed, and what a considerable extent is impossible of easy improvement for commercial use because of topographical features. There is in reality very small reason for the congestion which now exists on the west

side of Manhattan Island, along the waterfront of the Hudson River. This phenomenon seems to be one caused rather by habit and sentiment than by the laws of economics.

Should this question of economics be carefully analyzed it would doubtless show how the Bush Terminal (Figs. 7 and 8) has been able to build up what

FIG. 10—Map of Newark, N. J., by the City Plan Commission, showing the location of factories and, by dots, the relative number of workers with their daily distribution. (Courtesy of the Newark City Plan Commission.)

has been considered by many as the most perfect waterfront terminal in the world. Such a study would take into consideration population distribution, distribution of manufactures, passenger transportation, street traffic facilities, etc. Studies of each of these varieties have been made, as illustrated upon the population and factory maps of Newark (Figs. 9 and 10), prepared by its City Plan Commission; the present and projected rapid-transit system map of New York (Fig. 11), the time-zone map of New York, which

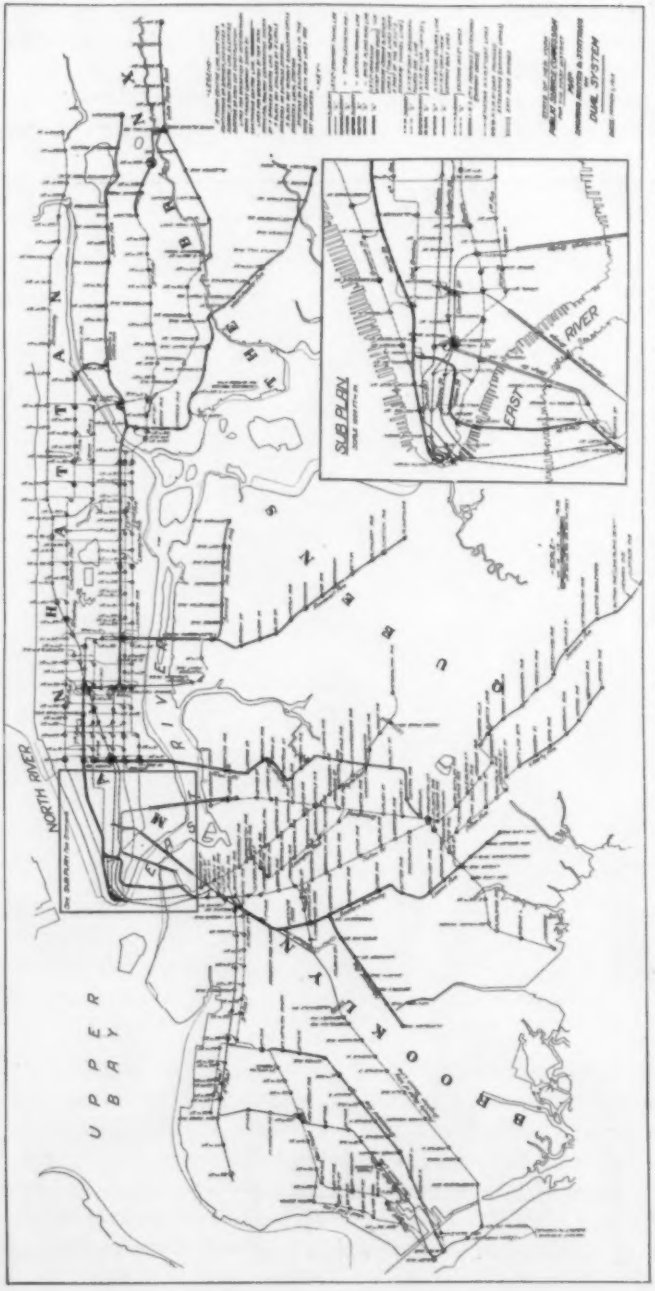

Fig. 11—Map by the Public Service Commission showing routes and stations on the municipal rapid transit lines of New York City. The scale of the original is 1:28,000; of this reduction, 1:200,000. (Courtesy of the Public Service Commission for the First District.)

indicates the minimum time in which all points in the city within a five-cent fare limit can be reached by the rapid-transit system (exists only as a manuscript drawing and is too complicated to reproduce here); the trolley traffic distribution map of the city of Newark (Fig. 12), etc. The time-zone map was prepared by the City Plan Commission of New York City,

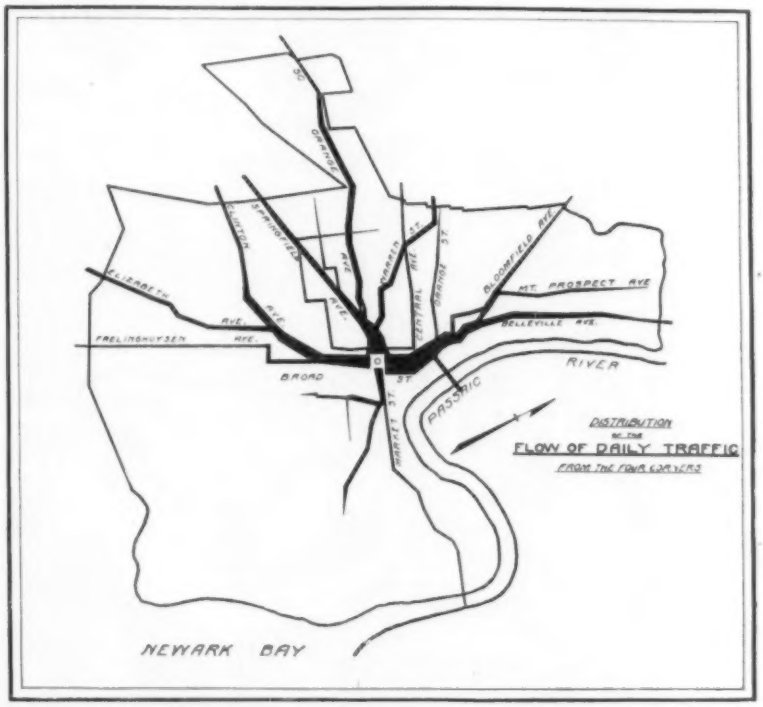

FIG. 12—A diagram representing the total number of passengers carried past various points in Newark, N.J., during a full day. Approximately 200,000 people enter and leave the "Four Corners" upon the trolley cars, each day, from 7 A.M. to 7 P.M. The greatest proportion of this travel is north and west as shown by the width of the bands in the diagram. These illustrate the proportion of travel upon each of the various routes. Note the great radial thoroughfares, the lack of cross-town lines, and the peculiar centralization at the "Four Corners." (Courtesy of the Newark City Plan Commission.)

which, in association with the Heights of Buildings Commission and the Commission on Building Districts and Restrictions (which three commissions are largely identical), has also studied the matters indicated by their names and are now presenting to the public and the authorities the results of their deliberations. The maps of Brooklyn indicating building-height limits (Fig. 13), limits of per cent of area which may be occupied by buildings (Fig. 14), and zones within which manufacturing and business and residences may be located (Fig. 15) are typical of those for the rest

of the city and, all taken together, if adopted[1], may so restrict population conditions as seriously to modify what may be called natural exigencies. Possibly housing congestion will be reduced, street traffic congestion controlled, street accidents minimized, real estate values stabilized, etc.

FIG. 13—A map of the Borough of Brooklyn showing proposed district of height-of-building restrictions. In the districts marked 1 buildings may be as high as the street is wide, but not more than 100 feet high; in the districts marked 1½ the height of buildings may be one and a half times the width of the street, but not more than 150 feet, etc. (Courtesy of the Commission on Building Districts and Restrictions.)

Closely related to maps are diagrams designed to represent combined geographical and other data. A "flow" diagram such as that of the "Four Corners" of Newark (Fig. 16) is fully as much a map as that of street

[1] Since this paper was read the zone maps have been legally adopted.

traffic already mentioned. The facts revealed by this diagram led to the promulgation of a police traffic rule prohibiting all left-hand turns. This prohibition resulted in an increased speed of traffic over the street intersection much more than proportional to the number of vehicles eliminated.

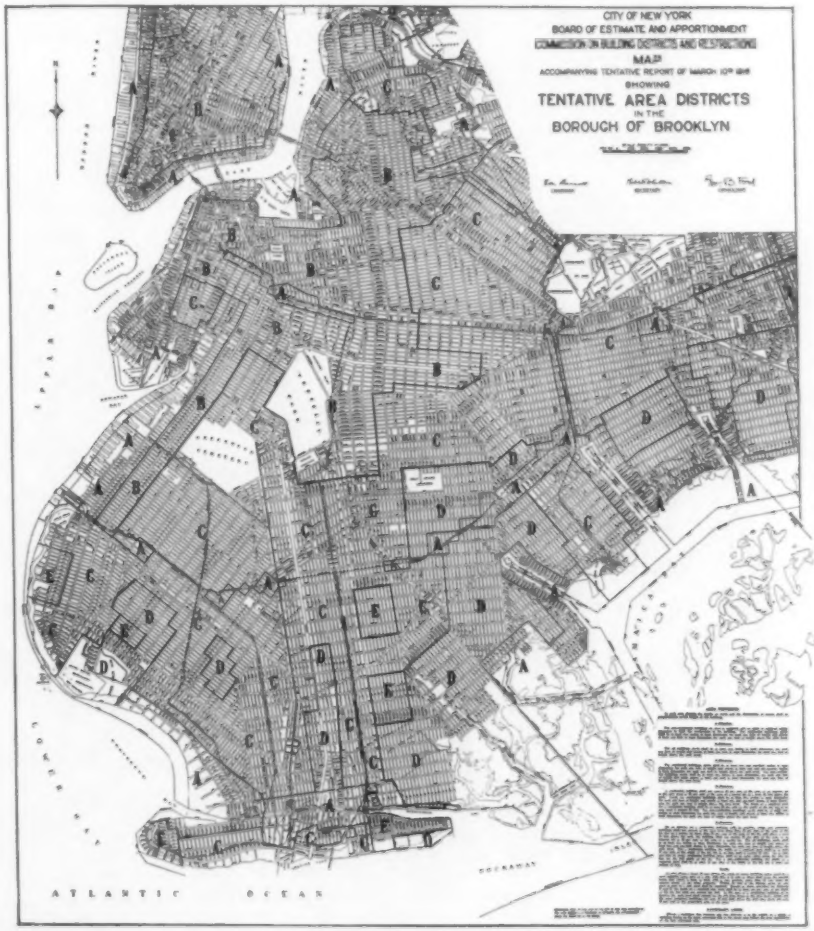

FIG. 14—A map of the Borough of Brooklyn showing proposed districts according to the proportion of the lot which may be occupied by the building on it. The area that may be covered by buildings decreases from the districts marked A, which are to be preserved mainly for business and manufacturing, to those marked E, which are to be kept for detached residences. (Courtesy of the Commission on Building Districts and Restrictions.)

The typical street-car riding diagrams of the same community (Figs. 17 and 18) visualize conditions along the full length of and at a designated spot on a certain street during each hour of the day, approximately, and are of material assistance in studying the daily movements of population. Another

diagram of somewhat similar kind shows the loading of trains on one of the New York Elevated lines as they passed a given station (Fig. 19). This diagram was constructed to show the state of congestion on the road and whether or not it was possible to divert the passengers from another route

FIG. 15—A map of the Borough of Brooklyn showing proposed restrictions on the use to which the streets are to be put according to the buildings fronting on them. Streets marked with a double hair-line are to be residential and restricted against business and industry; streets in heavy black are business streets to be restricted against manufacturing; streets in mottled design are unrestricted. The hatched areas bordering Jamaica and Gravesend Bays are also unrestricted. (Courtesy of the Commission on Building Districts and Restrictions.)

on to the trains of that line. It may be of interest to note that no one of the trains was loaded to the limit which has been set by the Board of Health as the maximum number of persons which should be allowed in a trolley car.

Still another diagram showing pedestrian traffic conditions on Nassau Street in Manhattan (Fig. 20) has been used to determine the numerical figure for the number of persons using a sidewalk per foot of width, per minute, at which the walk may be considered as congested. The figure measuring the number of persons on each sidewalk during the fifteen-minute period just preceding the one in which the roadway was jammed

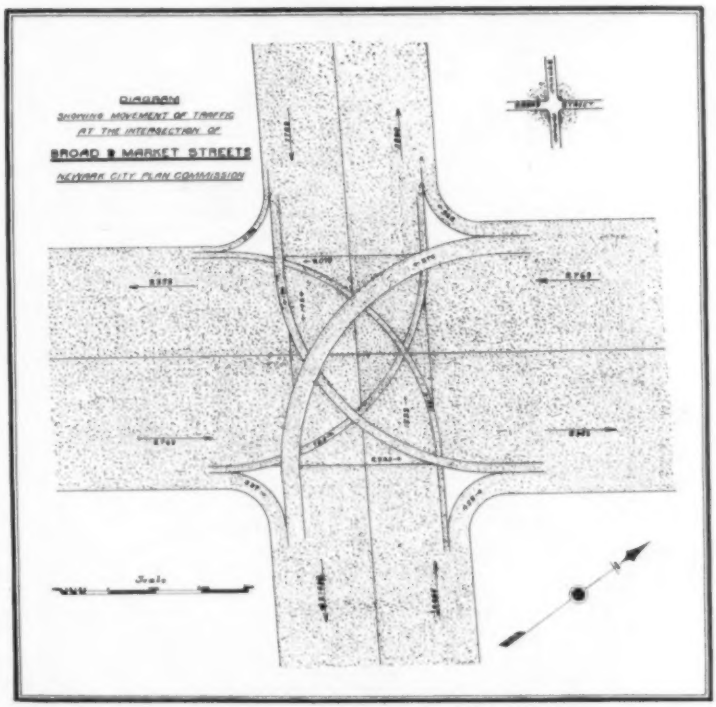

FIG. 16—A diagram showing the travel in each direction and on each turn at the principal intersection in Newark, N. J. The width of each band represents the proportion of travel in each of the various directions indicated by the arrows. The numbers show vehicles and cars which make this crossing each day, from 8 A.M. to 6 P.M. Note the small proportion of vehicles making left-hand turns. Since this study was made all left-hand turns have been prohibited at this point. (Courtesy of the Newark City Plan Commission.)

so strikingly (i. e. 11.45 A. M. to 12 M., with about 800 persons on each sidewalk and about 425 pedestrians in the roadway) is believed to represent with fair accuracy what may be termed a condition of congestion.

Some interest may also be found in the method used of ascertaining the average velocity of travel on Fifth Avenue across 34th Street by the device of identifying and numbering all the vehicles caught in a series of photographs taken every thirty seconds (see Figs. 21, 22, 23, and 24). The density is determined by averaging the total number of vehicles found in a block

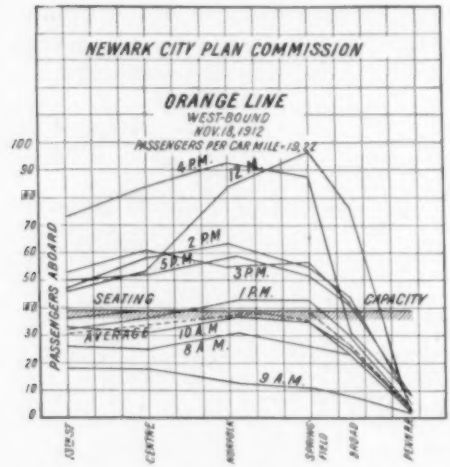

FIG. 17—A diagram showing the number of passengers on board a given car throughout a full typical trip, hour by hour, throughout the day of a Newark, N. J., street-car line. The number of passengers aboard at each point on the route is shown by the vertical scale. The hatched line represents the average seating capacity of each car. All curves above the seating capacity line represent standing passengers. Note the large number of standing passengers throughout very nearly the entire afternoon. This is one of the most congested lines in the city. Figures used in plotting this chart were obtained by men riding on the cars, a record of entering and leaving passengers being made at each stop.

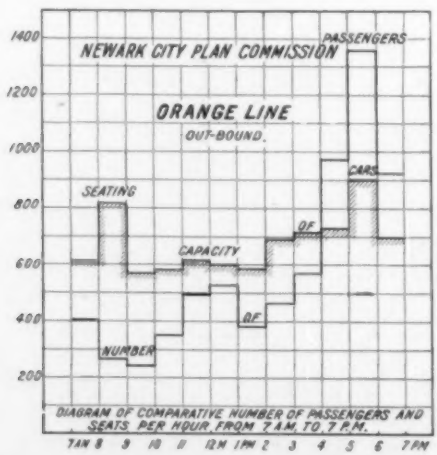

FIG. 18—A diagram illustrating supply and demand. The hatched line represents the total number of seats available each hour throughout the day, west-bound, on a Newark, N. J., street-car line. The full line represents the total number of passengers using this line, hour by hour, throughout the day. Note the excessive seat supply in the morning rush hour and the corresponding lack of seats in the evening rush hour. The irregularity of the flow of travel is well illustrated by the line of total passengers, and, by this, one can obtain a vague idea of the problem which faces the operating company in regulating the supply to meet the demand. Charts similar to this were made for each line operating in the city.

length in the several pictures. The total number passing is determined by the count. These two factors make a computation of the average velocity an easy matter.

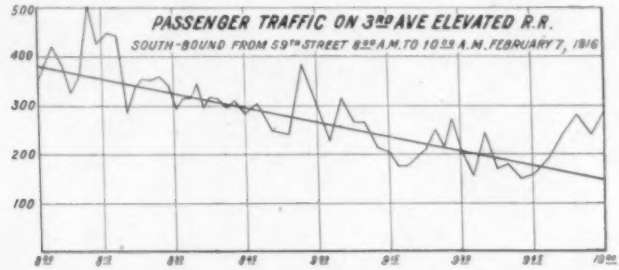

FIG. 19—A diagram showing the loading of trains on a New York Elevated line as they pass a given station. The figures on the left denote the number of passengers, those at the bottom the time from 8.00 to 10.00 A.M. Note the diminishing loading on every third train (approximately) and the diminishing loading as time passes during the morning rush hour.

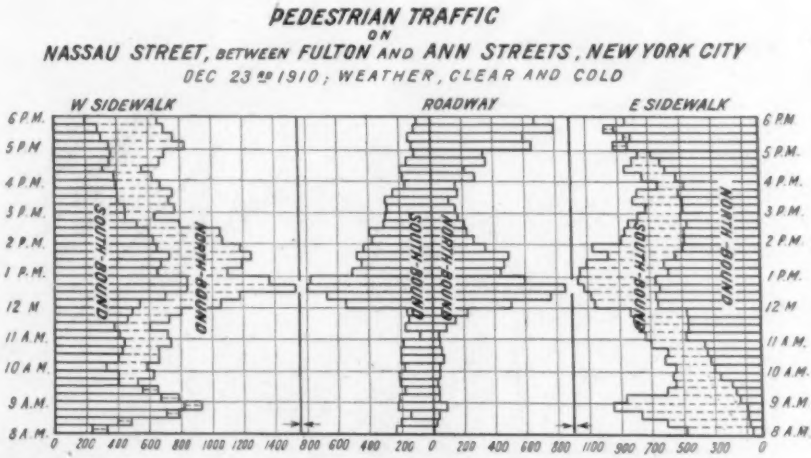

FIG. 20—A diagram showing the distribution of pedestrian traffic on Nassau Street, Borough of Manhattan, illustrating method of determining maximum convenient sidewalk traffic density. The figures at the bottom denote the number of pedestrians, there being a scale for each sidewalk and two for the roadway, increasing in the sense indicated by the arrow heads. The strips in the central section of the diagram indicate the overflow from the sidewalks. Note that at no time during business hours is the roadway free from pedestrians.

A natural line of inquiry growing out of street-traffic congestion studies is as to the future probabilities of the amount of street use. This query throws one instantly upon future population studies, in connection with which some diagrams of census statistics and their use in the realm of propheey may be worthy of examination. The experience of Greater London (see Fig. 25) as to uniformity of growth would lead one to feel that he could prophesy

FIG. 21.

FIG. 22.

FIG. 23.

FIG. 24.

FIGS. 21-24—Four photographs, taken from the top of a building, of traffic on Fifth Avenue just north of 34th Street, Borough of Manhattan, showing vehicular traffic conditions and how it is possible to count the number of vehicles through a comparison of photographs taken thirty seconds apart, thus making possible estimates of vehicle density and average velocity. The photographs are in pairs, Figures 21 and 22 and Figures 23 and 24 belonging together. The same vehicles may be identified in each pair of photographs. Thus, the open automobile, the fifth of the inner row on the far side of the street in Figure 21, has progressed to the street-corner in Figure 22 during the thirty seconds elapsed, while the horse truck in the lower right-hand corner of Figure 23 has progressed four-fifths of the length of block, as shown in Figure 24.

with a fair degree of probability as to future censuses. Prophecy as to the future of New York City and especially of its smaller subdivisions is much more difficult. The estimates for the Borough of Manhattan (see Fig. 26) were based on a careful survey of all lands not now occupied with buildings and of the numbers of low buildings which may be replaced by higher ones so as to house more persons.

Intimately related to future population estimates are the corresponding ones as to the probable uses of telephones, of transit facilities, of the total

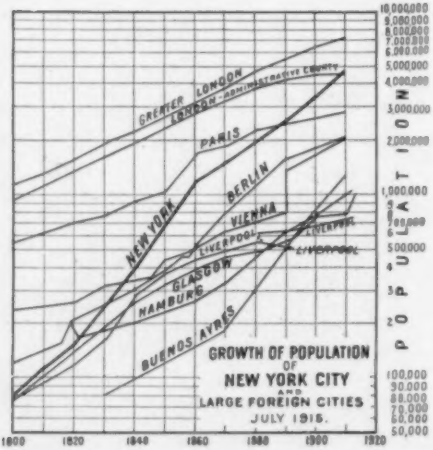

FIG. 25—A diagram of the growth of population of New York and large foreign cities. The relative uniformity of increase in many cases affords a fairly reliable basis for estimates of future population.

Figures 25 and 26 should be compared with the diagrams in Mark Jefferson's "How American Cities Grow," *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 19-37. The growth curves there, it should be borne in mind, however, often refer to the geographic and not the administrative city and are drawn on cross-section paper with co-ordinates of uniform intervals, while the present two diagrams are drawn with abscissas whose interval increasingly diminishes, a condition which tends to compress the growth curves.

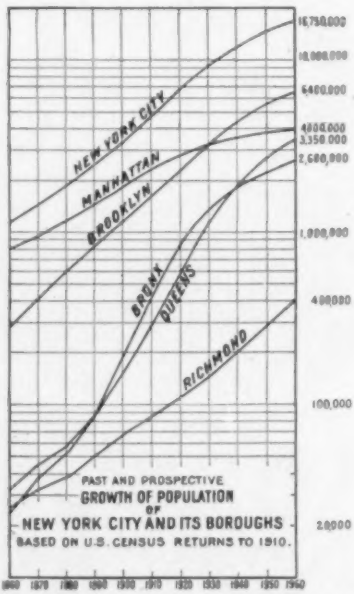

FIG. 26—A diagram of the growth of population of New York City and its boroughs since 1860, and estimates of future population to cover a century.

consumption of water, etc. (Studies of this nature have been made by the telephone company, those who laid out the present rapid-transit system, etc.) A diagram prepared by the Bureau of Contract Supervision of the Board of Estimate and Apportionment of New York City (Fig. 27) illustrates a line of study employed to determine the latest date at which new sources of water supply must be provided to meet indicated needs.

This rapid survey will suggest, it is hoped, the frequent points of contact in the work of the geographer and the municipal engineer. Both often have recourse to the same methods, the one in recording and interpreting,

the other in guiding the development of that most complex and concentrated unit of human geography, the city.

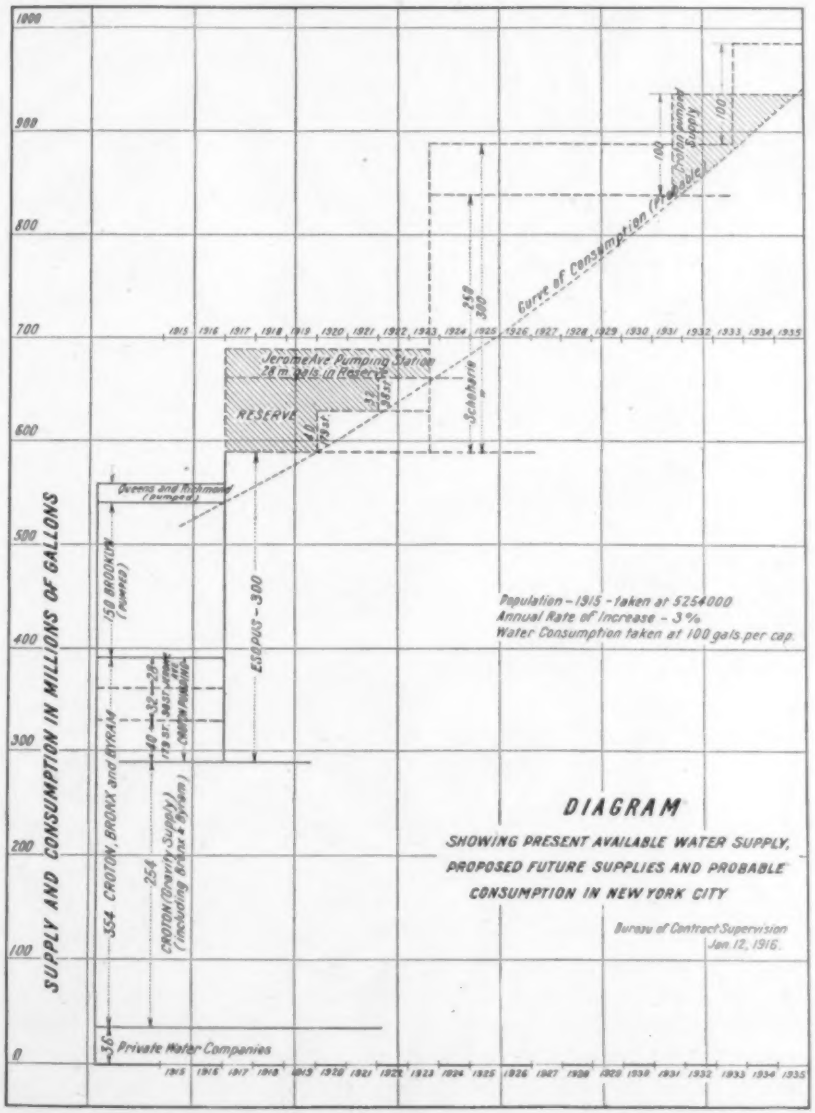

FIG. 27—A diagram showing the method of estimating future requirements for water supply based on probable curve of consumption and known sources of supply which can be made available from time to time. On the basis of this diagram estimates can be made as to the dates upon which a start must be made in developing new sources of supply, etc. (Copied from a diagram by the Bureau of Contract Supervision, Board of Estimate and Apportionment.)

THE POPULATION OF NEW YORK STATE*

By ALBERT PERRY BRIGHAM

In 1798 an obscure clergyman in a country parish in England wrote an unsigned book which brought him into the light and gave him fame. The author was Malthus, the book was the "Essay on the Principle of Population," and the object was the "future improvement of society." Eight years before the curate wrote his essay, the United States had set the world its first example of a complete enumeration of the people without reference to special ends. The pattern thus set, the nineteenth century saw the unfolding of the census among all civilized people.

In 1810, in our own country, questions were asked about manufactures and in 1840 the farm was included. In later years the mines and fisheries were taken in, and a wide variety of economic and social queries. Now bulky volumes packed with data come from presses whose work is never done.

All this implies the deepening intimacy of man with the earth. What people are, where they came from, how long they have been there, with what measure of power they use the forces and fruits of nature,—these are questions to be answered, and they belong jointly to geography, to social and industrial science, to race and to history. What fullness of meaning there is in the distribution of people was recognized by one of our foremost economists.[1] "The widest and most controlling condition of our status on earth is the ratio of our numbers to the land at our disposal. . . . . From one point of view history may be regarded as showing the fluctuations in the ratio of the population to the land."

The distribution of population may be said to involve the whole of human geography. Whether in a region the density be one or a thousand, there are reasons for it. To know these reasons we must open the whole field of reaction between man and his environment.

At the last federal enumeration New York had a population density of 191. This fact standing alone means little, but the view widens when we compare Illinois, with her richer fields, facile transportation, and her density of 101; or when we see that no state beyond the Mississippi River averaged half a hundred to the square mile.

All Canada holds fewer human occupants by millions than the Empire State. It is no simple question of latitude, soil, and climate, as witness the natural riches of Nova Scotia, Ontario, Manitoba, British Columbia, or the Yukon. Nor does geography, unaided by sister sciences, tell us why

* Read at the third joint meeting of the Association of American Geographers and the American Geographical Society, April 14 and 15, 1916.

[1] W. G. Sumner: Earth Hunger and Other Essays, pp. 32, 37.

New York in the last census decennium added more people to her number than the entire population of Mississippi, Kansas, Louisiana, or South Carolina.

We may take all of the states of New England except Maine, throw in New Jersey and Delaware and find remaining in New York enough land to equal three-fourths of Massachusetts. By eastern standards, New York with her 47,000 square miles is large. But there are in the Union twenty-eight larger states. It would require more than two New Yorks to cover Colorado, Arizona, or Nevada, more than three to be equal to California and more than five to match Texas. By western standards the Empire State is small. She recovers her dignity, however, if she looks across the sea and finds that she is nearly as large as England and about equals the combined area of the Netherlands, Denmark, Switzerland, and Montenegro.

The population of New York in 1910 was 9,133,614 and the density was 191. In 1915 the population had risen to 9,678,744, and the density was 203. In five years each average square mile had gained twelve new inhabitants, more than the total density of eleven of our states in 1910. In that year ten states showed a density exceeding 100. Of these, three are in New England, three in the Middle Atlantic group, two, Maryland and Delaware, are South Atlantic states, and two, Ohio and Illinois, are in the North-Central region. We need no further evidence to show how heavily the northeast balances the rest of the country and to explain why for decades the center of population has been making a dilatory movement across the state of Indiana.

In 1915 New York assumed rank, with three New England states and New Jersey, among the five that have passed the two hundred mark. In this connection the following comparison of densities is not without interest:

Italy	1914	321
Austria	1910	247
Hungary	1910	166
Austria-Hungary	1910	204
New York	1915	203

Recurring now for purposes of comparison to the figures of the Thirteenth Census, New York need not fear her showing with southern New England. We will assume an area in southeastern New York that is about equivalent to Massachusetts (Fig. 1). It will include all of Long Island, all of the City of New York, the Hudson River counties as far north as Albany and Rensselaer, and Orange County, in all seventeen counties. Here is a territory slightly larger than Massachusetts, having a density of 697, while the figure for the New England state is 418.

If, as shown in the map, we push toward central New York and cover eight additional counties, we shall include areas slightly greater than the combined surfaces of Massachusetts, Rhode Island, and Connecticut. The density in the selected part of New York is 453, and the average density

of the southern states of New England is 360. Once more may New York enforce her claim as a busy hive of human kind. We take eight counties in western New York (Fig. 1). These do not look big enough to be a state, but they do not widely depart, in area or combined form, from Connecticut. The density is 219, as compared with 231 for the Nutmeg State.

Nearly all of the western New York tract is rich, arable land of the Great Lake plains and of the hills among the Finger Lakes. But a small share of Connecticut is equally adapted to tillage, and we are not there-

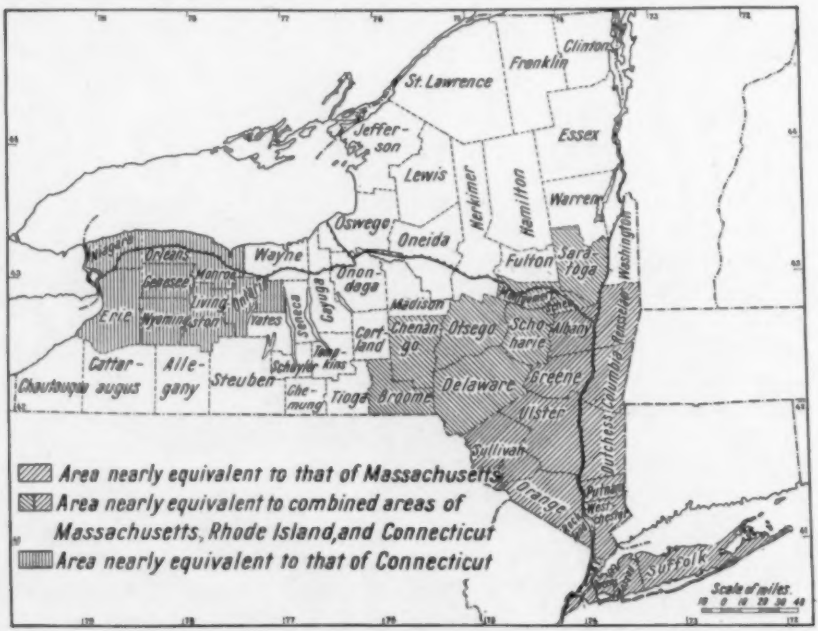

FIG. 1—Outline map of New York state showing county names and comparative areas. Scale, 1:5,680,000.

fore surprised when we compare the urban and rural population of the two areas. In face of the fact that Connecticut has no cities that compare in population with Buffalo and Rochester, she has 89.7 per cent of urban people, while the New York region has 55.4 per cent. Connecticut surpasses in the number of large towns and small cities, having seventy-two towns in the urban class, i. e. ranking above 2,500 in population. The New York region has but twenty-five such centers. The eight counties have seven cities with a population for each exceeding 10,000, while Connecticut has twenty-one such cities. It is clear that western New York, in some possible future equaling Connecticut's industrial activity, would far surpass her in population.

The center of population is near the village of Forestine, in Sullivan County (Fig. 6). It is, as we should expect, well to the southeast, in fact scarcely seventy miles from New York City. The growth of the metropolis has held steady control over the movement of the center, which in 1880 was in the southern part of Delaware County. The southward movement has accelerated steadily, being 6.5 miles from 1880 to 1890, 9.5 miles in the next ten years and 11 miles during the decade ending in 1910. In this last period alone the center swerved westward, a result apparently due to large increases of population in western New York.

We consider now the growth of population in the state as a whole, and we approach the record through a comparison with four typical states, one each in the New England, Southern, North-Central, and Western groups. We choose Massachusetts because she is like New York in diversified surface, industrial development, and accessibility to Europe. We select Alabama because that state is a good representative of southern agriculture, is open to the sea through an important port, and has, especially in iron, an industrial status. Illinois is, in her group, the natural analogue of New York, being rich in agriculture, far progressed in her factories, and open by lake and prairie to the continent. Washington is chosen because she is similar to New York in size, in her proportion of agricultural land, and in her potentialities of trade. All of these states, except Massachusetts, have important mineral resources. Massachusetts and New York are, for America, old; Alabama and Illinois are in middle age; and Washington is in the period of lusty youth.

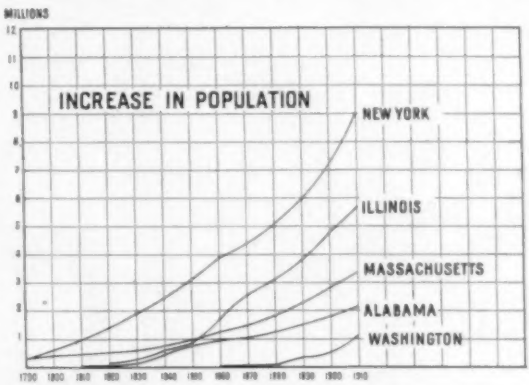

FIG. 2—Diagram showing the growth of population of New York state compared with that of other states.

Our first comparison of these four states with New York has to do with the actual increase and present totals. These facts are shown in Figure 2, the growth being set forth from the periods of earliest available data. It is well to observe, however, that this basis of comparison, while instructive, does not, owing to the variable size of the states, tell us much about the intensive development. And this is the more true because the duration of periods of growth varies from fifty to one hundred and twenty years.

Observing the curves of Figure 2 it is to be noted that those for New York and Massachusetts are more consistently progressive than any others.

The curve for Illinois is somewhat irregular throughout, though it is consistent in showing moderate growth from 1820 to 1850 and strong growth from the latter date to the present time. Illinois is a close parallel to Alabama to 1850 and then advances notably, nearly doubling in the following decade. The only break in the curve for New York is for the decade of the Civil War. Illinois is less apparently affected, but the curve flattens a little toward the end of that period. Massachusetts keeps her course, and Alabama becomes stationary for several years. In the last decade, New York's growth is largest, followed in order by Illinois, Washington, Massachusetts, and Alabama.

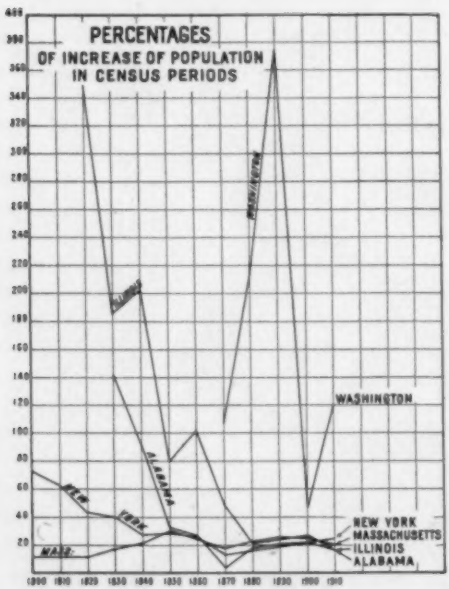

FIG. 3—Diagram showing percentage of increase of population of New York state compared with other states.

The next graph, Figure 3, shows for each decade the percentages of increase over the previous ten years. These are interesting but apparently erratic curves because of varying periods and conditions of settlement, but the curves show a tendency to settle down to a normal development. Thus New York and Massachusetts stand in sharp contrast until 1847, after which they are not greatly divergent until New York leaped ahead after 1900. Alabama, after a high percentage prior to 1830, comes down to a steady movement after 1850. Illinois with three long downward swings alternates two decades of upward movement and takes her place with her sober sister states in 1880. Washington has not yet lived beyond the prodigal spurts of her youth.

In turning now to Figure 4 we have the record of comparative increase of density of the five states under observation. This, it seems, brings us to the real test, by a criterion more satisfactory than either of the others. Here, however, the test would be more effective if the development periods had been of equal length. For this reason we can make no satisfactory comparison of Washington with any of the others. She has not had time to develop her capacity. We can, however, compare Alabama and Illinois with their coincident periods of population growth. They are close parallels from 1820 to 1850, as in Figure 2, but in respect of density Illinois is below Alabama in the early period and passes her in 1850. But here again

the curves do not show the actual capacity of the two states, because of the differences of political and social régime to which these states have long been subjected. New York and Massachusetts, however, may be more hopefully set side by side, for both are northern states, both are on the Atlantic seaboard, having comparable climates, and a similar historical and social groundwork. All of the states which go back to the time of the Civil War show at least a slight retardation in their increase of density. In the last Census decade all the curves have steepened except that of Illinois.

We now turn to the distribution and movements of population within the state. In Figure 5 are shown decreases of population from 1900 to 1910. The decrease of total population occurred in fifteen counties, about one fourth of the counties of the state. Of these fifteen, one is wholly in the Adirondack and two, Lewis and St. Lawrence, are partly in that province. Nine are wholly in the great plateau which stretches from the Catskills to the western border of the state. Greene County is divided between the Hudson Valley and the Catskills, while Madison and Ontario lie partly in the plateau and partly in the Lake Plains. Decrease has affected the lands of high altitude, severe climate, and lean soils, mostly regions of dairy and forest.

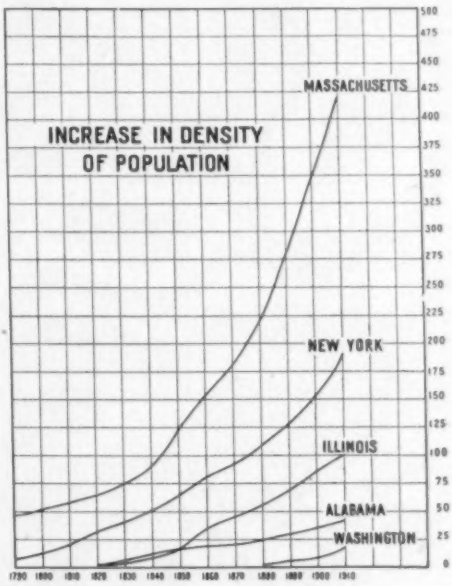

FIG. 4—Diagram showing increase in density of population of New York state compared with other states.

The general distribution of the rural population is to be seen in the maps of the federal census. The outstanding fact is that the rural population is most dense in the neighborhood of the larger cities. Thus Rockland, Westchester, and Nassau are the only counties having rural densities above 90. Densities of the next grade, 45 to 90, reach to Montauk Point and up the Hudson through Ulster and Columbia Counties. They then are found in Albany, Oneida, Onondaga, Monroe, Niagara, and Erie Counties, all containing large urban centers. This grade of density is found in a few counties which have no cities, no doubt by reason of exceptional conditions of soil and climate. Orleans, Livingston, Wayne, and Seneca Counties are examples.

There is not a single county having this grade of density of rural popu-

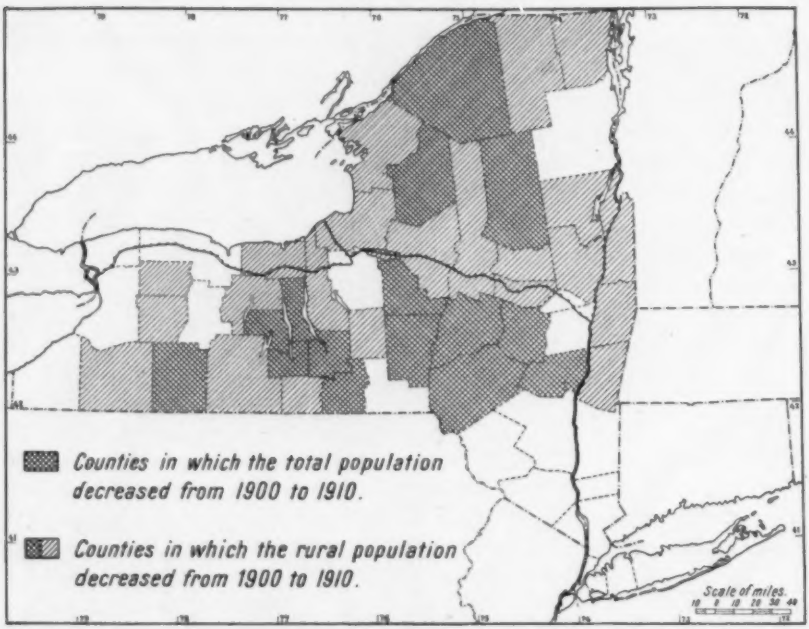
Counties in which the total population decreased from 1900 to 1910.
Counties in which the rural population decreased from 1900 to 1910.
Scale of miles.

FIG. 5.

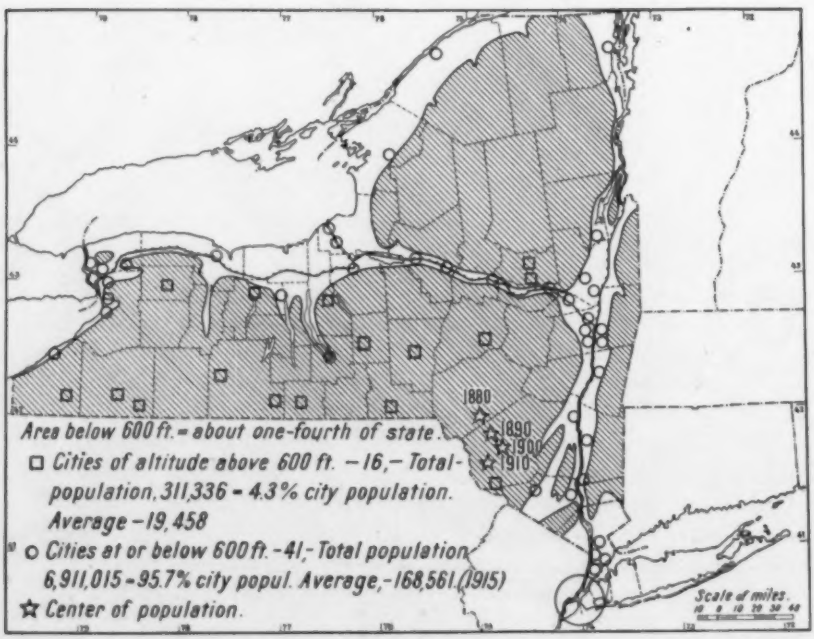
Area below 600 ft. = about one-fourth of state.
Cities of altitude above 600 ft. – 16, – Total population, 311,336 – 4.3% city population. Average – 19,458
Cities at or below 600 ft. – 41, – Total population 6,911,015 – 95.7% city popul. Average, – 168,561. (1915)
Center of population.
1880
1890
1900
1910
Scale of miles.

FIG. 6.

FIG. 5—Outline map of New York state showing the counties in which the total and the rural population decreased from 1900 to 1910.

FIG. 6—Outline map of New York state showing the relation of altitude to cities; also the movement of the center of population.

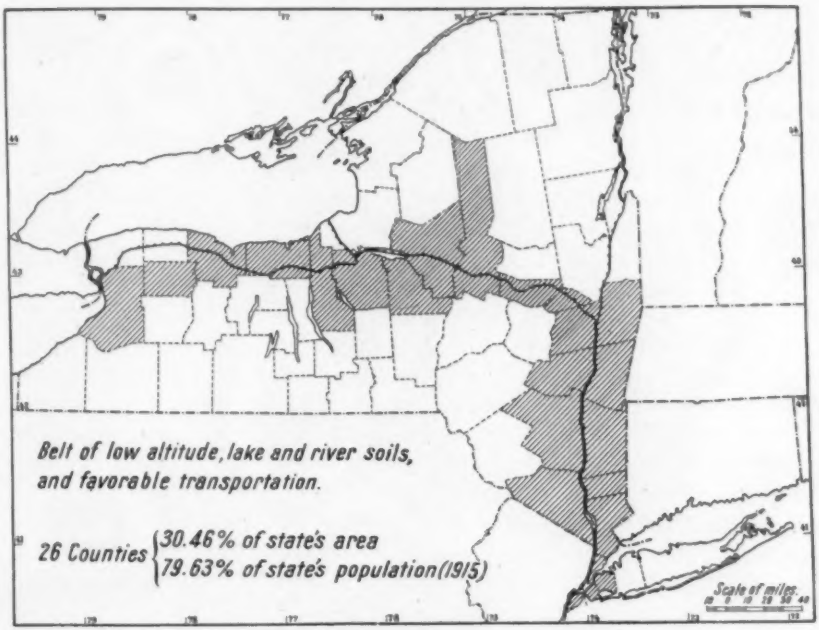
Belt of low altitude, lake and river soils,
and favorable transportation.
26 Counties {30.46% of state's area
79.63% of state's population (1915)
Scale of miles

FIG. 7.

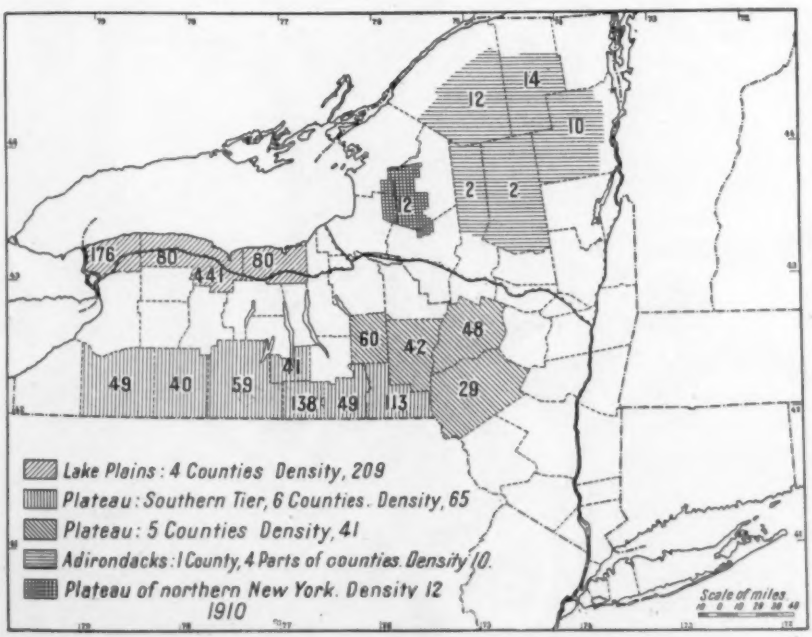

FIG. 8.

FIG. 7—Outline map of New York state showing the counties lying in the belt of low altitude, lake and river soils, and favorable transportation.

FIG. 8—Outline map of New York state showing the density of population of counties grouped according to physiographic regions. (*Note:* Schuyler County is incorrectly shaded; it should be included in the five plateau counties with a density of 41.)

lation in the "southern tier," from Sullivan to Chautauqua, nor a single example in the north and east from Oswego to Clinton, and from Clinton to Rensselaer.

The decrease of rural population in the last census period is more surprising than the losses of population as a whole, especially when we recall that the entire commonwealth had nearly two millions more people in 1910 than in 1900. The map (Fig. 5) shows that thirty-six counties out of sixty-one lost in rural residents. The rural population held its own in all regions lying approximately within one hundred miles of New York City. Beyond this limit only ten counties keep their rural status. All of these have urban centers except Orleans, Livingston, and Essex. Oneida is the only county having an urban center of more than fifty thousand people which did not hold its rural element. It is a bit curious that Oneida County, with the cities of Utica and Rome, should be in a different reckoning from Essex, an Adirondack county. It may perhaps be said that Essex had little to lose, much to gain.

It is not possible to give exact figures of the population in relation to altitude. Any contour lines crosses townships and election or school districts, and puts accurate data out of the question. Hence, choosing the contour of 600 feet, we will compare population centers, which stand in definite relation to such a line (Fig. 6). Approximately one-fourth of New York lies below this contour. There are in the state 57 cities, of which 16 are above the 600-foot line. These higher cities have an aggregate population of 311,336, giving an average of 19,458. Of the 41 cities on or below this line, the total population is 6,911,015, affording an average of 168,561. These figures are from the state census of 1915.

In addition to cities New York has 104 incorporated towns, each having a population of more than 2,500. Seventy-two of these are below the chosen contour, and their average population is 4,628. Thirty-two are above the line, and their average is 4,045. Of the hundred and more towns, thirty-five are a distinct response to the growth and needs of neighboring cities. Summarizing, all the urban population living below the line amounts to 6,781,547. The total for the greater altitudes is 440,804, or but 6.5 per cent of the whole. Thus it is as true in New York as in every part of the world, that people concentrate in regions of low altitude, of river, lake, and coastal-plain soils, of mild climate and easy transport.

We pass to what we may call a zone of cities and transportation, shown by shading in Figure 7. The map distinguishes twenty-six counties, chosen because they are traversed by the main lines of the New York Central Railway system between New York and Buffalo, or are directly served by them, as is the case with some of the counties of New York City. This belt of territory was described as regards its vital relation to the growth and trade of the United States in an earlier paper by the present writer.[2]

[2] The Eastern Gateway of the United States, *Geogr. Journ.*, Vol. 13, 1899, pp. 513-524.

Its significance as a population zone was set forth in a later paper[3] in which it was shown that it embraced about 30 per cent of the land surface of the state and held 77 per cent of the population. By the census of 1915 the precise figures are: area, 30.46 per cent; population, 79.63 per cent. Owing to the irregular extension of counties, the belt contains much thinly peopled land. Thus Greene and Ulster Counties reach far into the Catskill plateau, where villages are few and small and most of the land is covered with forest. The northern half of Herkimer County is in the Adirondack wilderness, with a density of 2 plus. A large part of Madison, Onondaga, and Cayuga Counties lies in the plateau, the line of traffic passing through the northern sections on the lake plains.

We should have a real test of concentration if we took a ten-mile strip from New York to Buffalo. The data are not available for such a computation, but if we take the series of townships crossed, it will come to much the same result. We shall have as a rule a single series of township areas in western and central New York, and a double series along the opposite banks of the Mohawk and Hudson Rivers, thus including the West Shore division of the New York Central lines. The average width of this belt is not far from ten miles, giving as a result, 6,910,131 people, or 70.87 per cent of the population on about 4,500 square miles, which form less than ten per cent of the territory of the state. This tract includes, except Binghamton, all the cities of New York whose population exceeds 50,000. It embraces also 28 of the 57 cities, while a dozen cities in adjoining counties are near at hand and are intimately dependent on this route.

Among the important criteria for the study of population is its relation to physiographic regions. Some attempt in this direction was made in compiling the statistics of the Twelfth Census, but studies of this nature are yet in their infancy, because we have as yet no accepted and detailed delineation of these provinces. This is true of New York as of other parts of the United States. Several natural regions can be outlined with a good degree of clearness for the state, and this will be attempted elsewhere by the writer. It is enough here to name certain well-known provinces such as the Appalachian Plateau, the Lake Plains, and the Adirondack region. Even if we had agreed upon boundaries, it would be difficult to determine population, for these lines cut all Census units of enumeration. But the density of typical parts of these regions offers a surer basis for study. Hence we take selected counties and parts of counties, whose populations are known. The areas for parts of counties are approximate.

Little comment is needed to supplement the map (Fig. 8). Four counties belong clearly and entirely to the Lake Plains province. Their soil is rich, their surface is easily tilled, the climate is favorable, and the transportation facilities are of a high order. Two contain cities and attain high densities, and two have no cities and show, by their common density

[3] The Distribution of Population in the United States, *Geogr. Journ.*, Vol. 32, 1908, pp. 380-389; ref. on p. 384.

of 80, highly developed rural conditions. The average density for the four counties is 209.

Six counties are taken in the Appalachian Plateau, in the "southern tier." They have high altitudes and are rather cold but are intersected by some broad and rich valleys. They have the advantage of an east-and-west transportation route, along the valleys of the Susquehanna and Chemung, which is second only to the route of the "eastern gateway." Two of the counties have cities of some size, Binghamton and Elmira, and show large densities. The others have small cities or none at all and show densities approximating 50. The average for the six counties is 65.

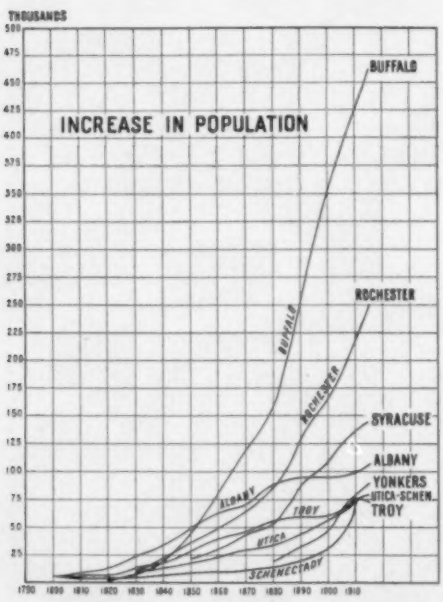

FIG. 9—Diagram showing the growth of population of the cities of New York state of over 50,000 inhabitants (except Binghamton and New York City).

Five counties from the same plateau are shown, which are similar to the others in surface and climate but sustain less favorable relations to through routes. Each of the counties but one contains a small city, but the average density drops to 41. In the Adirondack province we take one whole county, Hamilton, and four parts of counties, in Essex, Franklin, St. Lawrence, and Lewis. Here the surface is rugged, the soil poor, the climate severe, the surface mostly forested, and agricultural production is at a minimum. The densities range from 2 in Hamilton County to 14 in part of Franklin County, and the average is 10.

A small sandstone plateau lies between the Black River and the lake lowlands. The map shows selected towns in the central and higher parts of this area. The region is forested and is as truly a wilderness as the Adirondacks, and the towns included support 12 persons for each square mile. It is hardly too much to believe that detailed and intensive studies of population in reference to such natural provinces will lead us toward the inner meanings of geography.

The scope of this paper permits of little attention to that large theme, the location and growth of cities as affected by geographic conditions. The curves in Figure 9 compare the growth of the cities of the Empire State which exceed 50,000 in population, excepting the greatest, New York, and

the smallest, Binghamton. They all have the advantage of the state's major route of transportation.

The three older communities, Albany, Troy, and Schenectady, had attained about equal size in 1800. All have had but a moderate growth and find themselves not widely apart in 1915. Albany and Troy show a falling off in the decade of the Civil War, and both move on a level or in slight decadence from 1890 to 1900. Troy alone shows a sharp decline, from 1910 to 1915. Schenectady has a more consistent curve, with a long, slow rise to 1880, the growth quickening to 1900, strong to 1910, with retarded increase during the past five years.

The curves record the population of Buffalo and Rochester first for 1820 and 1830, and show steady, rapid, and rapidly increasing growths since 1830. These communities were little if at all affected in population growth during the Civil War period. Utica arose as a town considerably earlier than Buffalo, but her course runs coincidently with that of Buffalo from 1820 to 1835, when the latter city diverges on its long climb and Utica shows a smooth ascending curve, with retarded growth from 1910 to 1915 in coincidence with Schenectady. Yonkers is a newcomer among the large cities of the state and is to be regarded as a satellite of New York.

We may observe concerning the four large cities, Utica, Syracuse, Rochester, and Buffalo, that the population rank rises from east to west. There is not space here to substantiate the view which the writer holds concerning these cities, which is, that geographic conditions make Buffalo inevitably great; and that in view of geographic conditions Utica should have been as large as Syracuse, and that neither should have been so far outrun by Rochester.

By American standards, New York has a high density of population, and a large fraction of the state may be marked off whose people live closer together than in any other equal area in this hemisphere. Her growth in recent years puts out of court the notion that the East has reached its goal and that the West only is alive. Population is gathering in the cities, but it is also growing on the farms near the cities, where, by intensive tillage, the possibilites of our soil and climate are coming to light.

As everywhere else in the world, the greater number live on the lowlands, but lowland and highland, field and forest, lake and sea offer that diversity which enriches the life of all. The cities of the commonwealth, barely touched in this essay, hold out an alluring invitation to the student of geography.

It was in the mind of the writer to say something about New York's capacity for population, but the limits of this paper are already outrun and the handling of this fascinating but rather dangerous theme must lie in the future.

RECENT CHANGES IN BOGOSLOF VOLCANO

By SIDNEY POWERS, Ph.D.

Bogoslof, in Bering Sea, on the inner side of the Aleutian arc, is an unusual type of volcano, with pillar-like islands occasionally rising from the sea only to be in part or wholly destroyed by explosions. Since the earliest voyagers appeared in Bering Sea during the latter part of the eighteenth century, six islands have appeared, of which only three remain. These three peaks are now connected by sand bars and by the products of various volcanic explosions to form a single island.

The formation of the first island, Ship Rock, was reported by the earliest navigators about 1768, and the rock was not washed away by the powerful wave-attack of the open ocean until 1888. Old Bogoslof, now known as Castle Rock, was pushed from beneath the sea in 1796 as a solid rocky mass 4,000 feet in diameter and 350 feet in height. New Bogoslof (Grewingk or Fire Island) appeared in 1883 on the other side of Ship Rock from Old Bogoslof. The new island rose precipitously out of the sea to a height of over 800 feet, showing that it had been pushed out of an orifice in a very pasty condition instead of being formed of lava flows or ash which might accumulate around a crater.

Between 1883 and 1906 many changes took place in the forms of both Old and New Bogoslof, but no other islands were formed until March, 1906. In this month an island 2,000 feet in diameter and 400 feet in height appeared between Old and New Bogoslof. The names Perry Peak and Metcalf Peak were both given to this rock. The sides of the mass were described as being quite smooth and the top had the form of a "broken horn" as if the whole mass had been forced through an opening in the top of the submarine volcano. In the winter of 1906-07 half of Perry Peak was blown away and another spinelike mass rose not far away from the shattered side of Perry Peak. The new rock, McCulloch Peak, was about the same size and had the same form as the original Perry Peak, and, like the latter, was destroyed by an explosion ten months after its appearance, in September, 1907. Since this time nothing appears to have been published concerning the evolution of the volcano, and it is the aim of this paper to present what little information has been procured from the reports of government vessels.[1]

[1] The early history of the volcano is described by C. Hart Merriam in "Bogoslof, Our Newest Volcano," report of the Harriman Alaska Expedition, Vol. 2, pp. 291-336, New York, 1902, abstracted by the author in the *Annual Rept. of the Smithsonian Institution for 1901*, pp. 367-375. T. A. Jaggar, Jr., visited Bogoslof in August, 1907, and describes the evolution of Metcalf and McCulloch Peaks in the *Bull. Amer. Geogr. Soc.*, Vol. 40, 1908, pp. 385-400. The material for the present paper was secured from the U. S. Coast Guard, and the writer is indebted to Mr. E. P. Bertholf, the Captain Commandant, for permission to publish the reports, with map, made in 1910 by Capt. J. H. Quinan of the U. S. Revenue Cutter *Tahoma*.

The explosion of September, 1907, which destroyed McCulloch Peak, left a circular hot lagoon where the rock had been (Fig. 1). The debris of the explosion was scattered over the beaches and bars which had connected Old and New Bogoslof and Perry Peak and was piled into ridges near Perry Peak and Fire Island (New Bogoslof). In July, 1908, the fragment of Perry Peak which remained since the explosion of 1906 is reported to have been no longer visible. The land between Old Bogoslof and Fire Island enclosed a deep bay, and some new land had been formed elsewhere. The absence of Perry Peak and the deep bay both point to another explosion in the winter of 1907-08.

Renewed activity in the bay between Old Bogoslof and Fire Island is reported in September, 1909. The bay had closed to form a lagoon, in which two small islands had risen, one of which gave off steam. The water in the lagoon was also constantly steaming. The two small islands were apparently just beginning to rise as new rocky spines, for on June 16, 1910, they are reported to have united and risen to a height of 178 feet above the lake level. Old Bogoslof, Fire Island, and the southwest shore of the lagoon remained the same as in the preceding year, but the new spines had become connected with the northeast shore of the lagoon, and a portion of the shore on that side had risen ten feet. Although the temperature of the salt lagoon ranged from 62° to 110° F., there was little activity in the new rock-masses and water was boiling up from only a few places near the lagoon.

A survey of Bogoslof Island was made on September 10, 1910, under the direction of Captain J. H. Quinan of the U. S. Revenue Cutter *Tahoma*, showing that the island was about one and a half statute miles long and three-quarters of a mile wide, as shown in Figure 2. The elevations of the peaks were: Fire Island, 175 feet; Castle Rock (Old Bogoslof), 289 feet; the higher of the two central peaks, 178 feet; the lower, 100 feet. The lower of the central peaks is given the name Tahoma Peak by Captain Quinan in his report, and the higher is called Perry Peak in spite of the fact that the remaining portions of Perry Peak were reported to have disappeared by July, 1908. In view of the records given above, it seems probable that Captain Quinan saw a new peak which rose in 1909-10 in the same place that Perry Peak occupied from 1906-08. No name is suggested for this new peak.

Steam issued from the base and sides of the new peaks at the time of the visit, and steam was issuing from the salt lagoon shown on the map. Between the new peaks and Fire Island, in the mud-covered area near the small lagoon, an area of several hundred yards was in violent agitation. Boiling water was being ejected through the mud, and in two pools, each about four feet in diameter, water was being thrown to a height of five feet by the rapidly escaping steam. Another seat of activity was on the northeast side of Tahoma Peak, at the edge of the main lagoon. Explosions had recently taken place here, according to Captain Quinan's report, and

a group of steaming conical rocks had risen since the explosion. The water around these rocks was boiling, but not so violently as near the smaller lagoon. The temperature of the water in the main lagoon was found to be 107° F. on the south side of the new peaks and 90° F. at the end nearest Fire Island.

The eruptions at Bogoslof are much more frequent than recorded, because no vessels are in the vicinity, but fortunately Captain Quinan sailed back toward the island on September 18, and when about twenty-five miles away

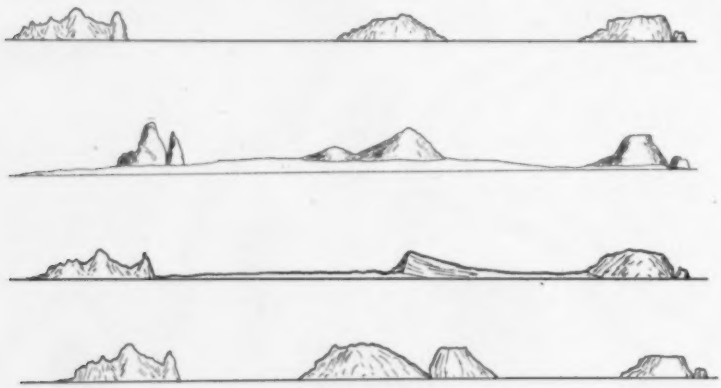

FIG. 1—Profile views showing the successive stages in the evolution of Bogoslof Volcano, from 1906-1910. (*Note:* The second and fourth profiles should be transposed. The explanation that follows refers to the correct order.)

In each of the sketches Castle Rock (Old Bogoslof) is on the left and Fire Island (New Bogoslof) on the right. In the first, Perry Peak is shown in the center as it was during the summer of 1906. In the second profile (August, 1907), Perry Peak remains as a half dome, and, on the side which has been blown away, McCulloch Peak appears. In the third profile, (September, 1907, after the explosion of McCulloch Peak), only a fragment of Perry Peak is left, and Old and New Bogoslof are connected by the debris of the explosion. During the interval between the third and fourth profiles the remainder of Perry Peak was destroyed, and, near the site, the two central peaks shown in the fourth sketch rose in 1909-1910 and are seen here in September, 1910. (The first three profiles are sketched from *Bull. Amer. Geogr. Soc.*, Vol. 40, 1908; the fourth is from the sketch by Lieut. A. H. Scally in 1910.)

in the early morning witnessed an eruption. Forked lightning in the direction of Bogoslof was seen before daylight, and when Bogoslof was sighted the new central peak was seen to be in a state of eruption. Immense clouds of vapor, smoke, and ashes issued from the peak and enveloped the entire island. Flames were reported at the peak, and lightning followed by thunder appeared in the cauliflower cloud of smoke and volcanic dust which rose to a height of several thousand feet above the island. The eruption lasted during the several hours the steamer remained in the vicinity, and two days later the central peak was observed to be still steaming.

The eruption of September, 1910, appears to have opened a true crater in the top of the central peak—the first important crater which has been reported on any of the masses of very viscous rock which have been slowly

pushed out from the top of the submarine volcano to form the "rocks" and "peaks" of the last hundred and fifty years. The opening of a small crater is merely the closing stage of activity for the particular peak and corresponds to the explosions which destroyed Perry and McCulloch Peaks. The gas and vapor found a place of weakness where they could escape without blowing off the entire carapace which confined them.

There are no reports for 1911 or 1912, and in July, 1913, a brief statement refers to the crater as being plainly visible with steam and smoke

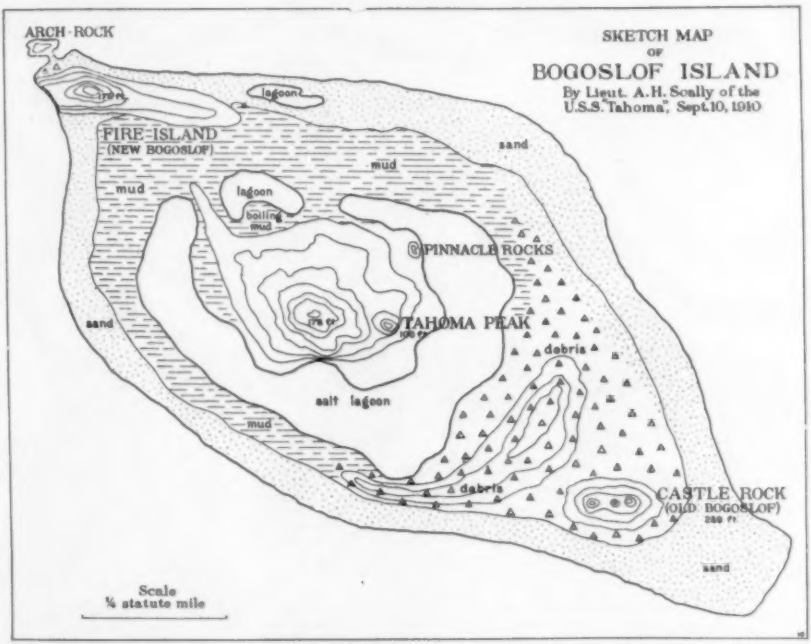

FIG. 2—Sketch-map of Bogoslof Island on September 10, 1910, showing Castle Rock, Fire Island, and the two new peaks in the center. Scale, 1:189,400. (From a map by Lieut. A. H. Scully of the U. S. S. *Tahoma*.)

slowly issuing from it. Activity apparently ceased during this year, for the commanding officer of the steamer *Patterson*, which passed Bogoslof on its way to pick up the survivors of the *Tahoma*, reports that "the Bogoslof Islands showed three peaks in 1914, none of which was smoking."

No reports concerning Bogoslof since 1914 are at hand. And so it happens that this active submarine volcano rising from depths of a thousand fathoms goes unnoticed from year to year so far as scientific information is concerned, and, although the port of Unalaska is only about 60 miles away, many peaks may rise and be blown away with no record of the event.

GEOGRAPHICAL RECORD

NORTH AMERICA

Recent Floods in the South. The flood which occurred in the mountainous region of western North Carolina after the heavy downpour of the night of July 15 illustrated in a practical manner the retarding effect of forest cover on the velocity of the run-off. According to measurement records of the Weather Bureau from 10 to 15 inches of water had fallen by the morning of the 16th. A flood of great velocity started on the headwaters of the Catawba River in the Blue Ridge, east of Mt. Mitchell. Its destructive effects, and that of other rivers whose sources lie in the same region, included the death of over eighty persons and the setting in motion of landslides and mud avalanches

FIG. 1—View showing the effect of the flood of July 15 in the upper valley of the Catawba River in North Carolina. Cornfield laid flat and buried in sand. This view was typical of all lowland areas along the river. As the corn was in tassel there was no possibility of a second crop. (Photo by H. H. Chapman.)

which carried and strewed great quantities of boulders, tree stumps, and other débris in their path, destroying farms and, in places, leaving a waste where soil had been worth $200 an acre.

Throughout the afflicted area the danger was heaviest where a protecting belt of timber was lacking to arrest the progress of the silt and wreckage carried by the stream. Furthermore, the upper slopes of the mountains had until recently been devastated by forest fires and lay bare of trees. The overwhelming mass of water swept, therefore, unchecked on to the lower slopes. In one instance, on the Catawba River, the farm of George Carson, which was almost entirely carried away, could have stood the fury of the flood had a thick grove of timber on an island lying directly above the farm not been cut for the purpose of bringing more land under cultivation. In this case, the island itself was destroyed and at least fifty acres of valuable bottom land were ruined.

Upon investigation (see "Southern Floods and Their Forestry Lesson," by H. H. Chapman, *American Forestry*, August, 1916, pp. 476-479) it became apparent that the floods originated on steep slopes of high ridges. The steepness increased the normal run-off of the water and prevented absorption by the soil. The flood crests were particularly destructive, and a considerable portion of the total damage was due to their action, which

was likened to that of a bursting dam. Nothing but tree protection could have prevented the high flood crests and saved the river valleys from destruction.

About a month later, on August 9, floods devastated the valley occupied by Cabin Creek, a small tributary of the Kanawha, in the West Virginia coal district. Over one hundred lives were lost and millions of dollars' worth of property ruined. A large number of miners' cabins were swept away, rendering five thousand persons homeless. Four hundred square miles of bottom land were reported devastated. Eighteen miles of track on the Chesapeake and Ohio Railway were demolished. Every bridge was swept away. Railroad officials at the time declared it would take sixty days to rebuild the line.

A consequence of the excessive rainfall of that period was the bursting, on August 13, of the dam enclosing Lake Toxaway in North Carolina. The lake was an artificial body of water, having been created in connection with a summer resort. It was 550 acres in extent and 30 feet in depth and lay at an altitude of 3,000 feet on the

FIG. 2—View of flood effect of July 15 in Clear Creek, quarter of a mile below the junction of the upper forks. Forest ranger's frame house upstream hanging over the bank. In center, lower part of slide a thousand feet long, which crossed the stream. Site of a small sawmill on the left, which was completely destroyed, carrying boiler and engine several hundred feet downstream. One pile of lumber left, protected by a big drift of débris. Original channel of stream was 20 to 30 feet wide; the rest is cornland. (Photo by H. H. Chapman.)

Mississippi-Atlantic divide at the head of the French Broad River. It drained south through the Keowee River to the Savannah River. No lives were reported lost, but much damage was done in the lowlands of the upper reaches of the valley.

Forest Conservation and Stream Protection in the Southern Appalachians. Under the Weeks Law an important beginning has been made by the National Forest Reservation Commission (New England's Federal Forest Reserve, by Philip W. Ayres, *American Forestry*, July, 1915; abstracted in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 875-876) in saving the steep mountain slopes of the South from deforestation and the train of evils that follow in its wake. The forests of the Southern Appalachians are the chief source of hardwood timber in the United States, and our future supply depends upon their conservation (The Southern Appalachian Forests, by H. B. Ayres and W. W. Ashe, *U. S. Geol. Surv. Prof. Paper 37*, 1905). They also hold the soil on the steep mountain slopes where otherwise it would soon be removed by erosion, since the region has the heaviest rainfall of any portion of the United States except the Puget Sound region, and frost action is vigorous. Through a careless system of agriculture many slopes, too steep for safe cultivation, have been cleared, farmed a few years, and abandoned because of gullying. Careless lumbering, forest fires, and, at Ducktown, the killing of the forests by copper smelting have aided soil erosion (Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin, by L. C. Glenn, *U. S. Geol. Surv. Prof. Paper 72*, 1911). The material eroded from the steep

slopes soon fills the channels of the small streams and increases floods and flood damages. It works down into the larger rivers, fills the storage reservoirs of the electric power companies, and builds bars and otherwise fills and obstructs the channels of navigable rivers, such as the Tennessee and others. The accompanying figure, based on a map prepared by the U. S. Forest Service, shows the large area affected by the streams flowing from the mountain area. It also shows how small the area already purchased is to the area that should be purchased to afford the needed protection. It is doubtless not intended that the area designated on this map as non-agricultural land shall

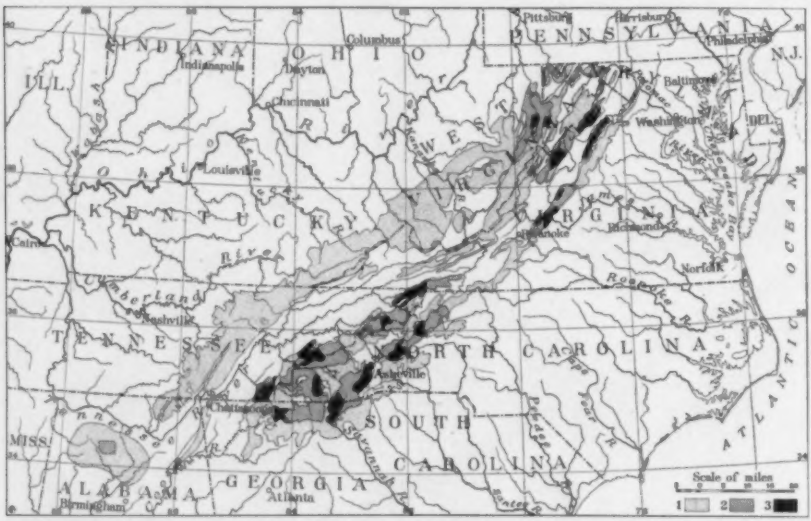

FIG. 1—Sketch-map showing the status of forest land in the Southern Appalachians, based on a map by the U. S. Forest Service. Scale, 1:10,750,000.

Key to symbols: 1, non-agricultural land; 2, areas in which land is being purchased; 3, tracts approved for purchase by the National Forest Reservation Commission.

be interpreted too literally, since in many parts of the region so designated there are stream valleys, level areas, and low slopes upon which a considerable agricultural population is found. The Weeks Law expired by limitation in 1915, leaving unexpended three of the eleven million dollars carried by the bill, and the Commission in its report to Congress in December last recommends a further appropriation of $10,000,000 (Further Appropriations Needed, *American Forestry*, Jan., 1916) for a period of five years to make additional purchases to protect the headwaters of navigable streams in New England and the Southern Appalachians.

L. C. GLENN.

Currents Off the Alaskan Coast. A prevailing current flows northward and westward along the coast of British Columbia and Alaska at an estimated velocity of 0 to 1½ knots. It attains its maximum intensity near the coast, generally within the 100-fathom curve, and varies greatly with the winds. Details regarding conditions affecting navigation can be gathered from the "United States Coast Pilot for Alaska, Part II: Yakutat Bay to Arctic Ocean," the first edition of which has recently been issued by the U. S. Coast and Geodetic Survey.

It seems probable that the Japan Current does not reach the shores of the Alaska Peninsula and that it does not even attain the southernmost of the Aleutian Islands. The warm current generally believed to originate in the Gulf of Alaska and flowing westward along the coast to Unalaska Island appears to be continual. Its influence is reflected in the milder climate of the southern coast of the peninsula, and this accounts for the natives' preference to live in the locality rather than on the mainland coast, which is subject to Bering Sea influences.

The currents in the Aleutian Island passages are generally strong and almost always flow into Bering Sea. The temperatures in these currents are not high enough to war-

rant belief in their being part of the Japan Current. Southward of the Aleutian Islands there is often a current toward all the passages; but farther off shore, well out of sight of land, the Japan Current is found setting eastward. On the northern side of the islands the current sets eastward. Bad weather, as a rule, affects the regular flow of water in all the region, and an abnormal current is often a storm warning.

Land Developments in Arizona. Public attention in Arizona has lately been focussed on two Federal operations—the assignment of 2,000,000 acres of land for a Papago Indian reservation (*The Nation*, Jan. 27, 1916) and the range experiment now being conducted by the U. S. Forest Service (*The Independent*, Jan. 31, 1916). Both movements are in response to the scant water supply of southern Arizona. The Indians—Papagos and Pimas—have suffered from American and Mexican encroachments on their land and water rights, even in the reservations. A few Papago Indians are located on the Pima and two other small reservations, but the majority of the tribe, scattered over the northern part of the great Sonora Desert, has maintained the free and independent life so charmingly described by Carl Lumholtz in his "New Trails in Mexico."

The aridity of southern Arizona imposes a seasonal nomadism on its inhabitants. The Papagos, who raise crops on the flat valley floors in the summer, move in the winter to the better-watered sierras. The cattle ranchers, similarly, have their winter and summer ranges. The conservation of these, in a land where grazing must form the principal ultimate resource, is a matter of public concern. This is a part of the valuable work of the national Forest Service. Within the last few years reconnaissance work has been carried out on the Arizona ranges. Today an important experiment is in operation. Twelve years ago the depleted Santa Rita Range was withdrawn from the public. Now 50,000 acres, divided into four sections, two each for summer and winter ranges, have been opened to 800 head of cattle. The range includes two distinct types of grazing, the one characterized by mesquite, brush, and scant grass, the other by the excellent grama grass; hence it is well adapted to the experimental purpose.

EUROPE

Early Danish Hydrographic Surveys. The beginnings of chart-making in Denmark can be traced to the first half of the seventeenth century. This period is one in which notable progress was made in the Danish shipping industry. In August, 1622, Johan Isaksen Pontanus, the Royal Historiographer, was commissioned to prepare a Danish edition of charts of the coasts of Denmark. Prior to this time navigators had been obliged to rely on foreign compilations, mostly made in Holland. But the information collected on the foreign charts lacked accuracy, and the need of an actual survey was keenly felt by Danish seamen.

Pontanus appears to have been unable to fulfill the royal instructions, and it was not until 1688 that surveying operations of a practical value were undertaken. In the summer of that year a chart of the Sound was prepared under the supervision of Jørgen Dinesen Oxendorph, then Director of Navigation. The chart, however, was never published, according to a notice on the "Life and Cartographical Work of Jens Sørensen," accompanying the collection of charts prepared by this hydrographer and recently reproduced in facsimile and edited by Johannes Knudsen under the auspices of the Carlsberg Foundation at Copenhagen (F. Hendriksen, publisher). The same fate befell a chart of the entrance channel to the port of Copenhagen, drawn in January of the next year. Various attempts made before that time were equally fruitless. The appointment of Jonas Vestmand as Marine Surveyor in 1647 bore no results on account of his death in 1649.

The period of accomplishment dates from May 30, 1689, when Jens Sørensen's request to the king for "permission to make new charts" was presented. The applicant pointed out the serious errors contained in the Dutch charts, then the only ones available, and dwelt on the dangers lying in the path of Danish navigators sailing in home waters and especially in the Baltic. He also called attention to the knowledge of hidden reefs and shoals which he had acquired in the course of twenty-one years' experience in those waters. In proof of his earnestness he submitted the drawing of one of the charts he had prepared in person.

His petition was received with favor, and on the 11th of June of the same year he learned that the king had entrusted him with the task of "preparing for print new sea charts of the Baltic and our waters." In 1690 a vessel was placed under his orders for the carrying out of surveys in Danish waters. Special surveying cruises were undertaken in 1692, 1694, 1697, and 1703. In the years 1705 and 1706 Sørensen even

ventured to extend his observations to the Norwegian coasts of the Skagerak from Kjæringøen to Christiania and from the mouth of Christiania Fiord to Arendal. His field operations ended in 1706. While engaged in the task of drafting his results, the Great Northern War of the years 1709-20 broke out and prevented the Danish treasury from providing further funds for surveying work.

A comparison of Sørensen's charts with modern productions reveals the superiority of his work over similar publications of his contemporaries. His achievement is noteworthy when we consider the primitive character of his methods and instruments (his surveys were based only on compass bearings and measured or estimated distances, no positions being astronomically determined) and the fact that his scientific education had been neglected. His great familiarity with Danish waters, added to a keen power of observation, alone enabled him to produce the accurate outline of the Danish coast and the complicated system of its waters. Unfortunately the international conditions then prevailing prevented his charts from being published. The Danish Admiralty was adverse to the dissemination of the information which he had gathered. His charts were used only on board the king's ships, even merchantmen of Danish nationality not being allowed to keep copies.

The Population of the Baltic Provinces of Russia. An article on the inhabitants of this region, written from the German standpoint, is contributed by Dr. H. Rosen to *Petermanns Mitteilungen* for September, 1915 (see the entry in the March *Review*, with comment on the accompanying map). The three Baltic provinces of Courland, Livonia, and Esthonia are considered as a domain of German culture and of Protestant faith controlled by Russian political and religious power. Persistent attempts to Russify the region have been carried on since 1880 without, however, producing noteworthy results. In the revolutionary period of 1905 this section of Russia was considerably affected. The Lettish element in its population is considered as a mixture of Aryan and Finnish peoples, this being somewhat at variance with the generally accepted belief in the purity of the Aryan stock peopling these provinces. The Esthonians, too, according to Doctor Rosen, are a product of the blending of Finnish and Teutonic peoples. He cites in point the Fellin district in southern Esthonia, where a very pure Teutonic type is met among peoples of Esthonian speech. The Poles who inhabit these provinces number some 36,000 individuals and are represented as being strongly Germanized. The 62,686 Jews who make up 2.65 per cent of the total population are also faithful supporters of German ideas.

The Lithuanians are distributed mainly in the governments of Kovno and Suwalki, which adjoin the German province of East Prussia. They consist of Lithuanians proper and of Shamaits, otherwise known as Zhmuds. Very few dialectical differences exist between the two. The latter cluster mostly in northwestern Kovno without, however, attaining the Baltic shore. According to the last available Russian census (1897) they number 1,638,530 inhabitants, of whom 1,113,853 live in the Kovno government, 304,548 in Suwalki, while 220,129 are distributed in the Polish and Baltic governments. Emigration in the past decade to large Russian cities and America has decreased their number appreciably. The Lithuanian as a rule is not on the best of terms with neighboring peoples. He looks upon the Russian as his political oppressor and upon the Pole as his hereditary foe. The Lett is regarded, with somewhat less animosity perhaps, as a rival.

A Masurian element constitutes the majority of the inhabitants of Augustovo and Seiny, the two southernmost districts of the government of Suwalki. The German element is strongly represented in the entire region. It forms a contingent of some 70,000 individuals in the governments of Kovno and Suwalki. In the province of Courland the Germans boast of 51,000 resident kinsmen. As a rule this section of the population is confined to the cities. Riga, Reval, Libau, Dorpat, and Mitau each contain notable percentages of Germans among their citizens. The first-named city numbered 65,332 of these westerners in its population, or over 25 per cent of the total.

The Winter Climate of the Eastern Mediterranean. Major H. G. Lyons, President of the Royal Meteorological Society, read a paper on the winter climate of the eastern Mediterranean before that society at its January meeting (*Quart. Journ. Roy. Meteorol. Soc.*, April, 1916). Taking into consideration the special interest in the eastern Mediterranean at the present time, the author considers it important to study the climatic conditions of that region because of their bearing upon naval and military operations. Meteorological observations and problems now have a very practical value. The general weather characteristics of the eastern Mediterranean range from the rigorous continental type met with in the high plateau of the Balkan states to the uniform Mediterranean type of southern Greece and the Levant and the subtropical climate of Egypt. In the Balkan Peninsula, temperatures of 0° Fahrenheit have frequently been

recorded on the high plateau up to the month of March, and it is only when nearing the Aegean Sea that there is a mean temperature above 32° for all the winter months. Associated with the continental type, the monthly precipitation is comparatively uniform, taking the form of heavy showers rather than of continuous rain. In the coastal region the winter months have heavy rainfall. In Egypt the rainfall of the winter months is insignificant. Snowfall is reported as far south as Athens, but even at Saloniki the days with snow are few. Inland, the number of days with snowfall increases to about one-third of the days with precipitation in the Bulgarian hills. Severe conditions occur occasionally at Saloniki, where, in 1903, the sea was frozen for two days to a thickness of 1 centimeter. In regard to the gales which have been frequently experienced in the Aegean Sea during the progress of the war, it is the opinion of Major Lyons that those from the southwest do not appear to have been common in past years, but may be considered generally to be the result of cyclones passing over the north of the Balkan Peninsula or approaching the west of Greece. These are normally of short duration, lasting seldom more than one or two days. The normal winter pressure distribution, however, with anticyclonic conditions over Russia, and extending to the Balkans, favors a gravitational flow of cold air from the north. When associated with marked cyclonic conditions in the south, northerly gales hold for four, five, or six days. R. DEC. WARD.

Junction of the Greek to the Main European Railroad System. The recent completion of the railroad link along the Aegean between Gida on the Saloniki-Monastir line and Papapuli, in Thessaly, will, after the war is over, put Athens in direct rail communication with all European points northwest of the Balkans. According to *Commerce Reports* (May 27, 1916, p. 771) the connecting line is 56 miles long and transportation was to begin during May.

The roadway will benefit Athens and the Piraeus particularly. The journey between Paris and the Greek capital will be reduced to some sixty hours. Part of the freight routed to cities in Asiatic Turkey, via Constantinople and Saloniki, will probably be diverted to the Piraeus and shipped thence by water to Smyrna. Furthermore, thanks to its through connections, the port of Piraeus now becomes the European railhead nearest to Egypt and the water route to India. It may therefore attract in time part of the Indian trade and enable European lines to compete with the much-advertised, though still incompleted, Bagdad Railway.

Greece's economic condition will change materially through this important connection. A European transcontinental line ending at Athens is bound to affect Greek maritime trade in general. Locally, the bringing of Saloniki to some twelve hours' ride from the capital must also cause readjustments in internal trade.

Rumanian Trade with the Warring Nations. Prior to Rumania's declaration of war, the swinging of her political pendulum between the two hostile groups in Europe was the subject of much comment. A survey of the country's economic geography and the analysis of figures supplied by Dr. Luigi Bissoli in the March, 1916, number of *L'Esplorazione Commerciale* of Milan is illuminating in this connection. Rumania, like all the Balkan states, is essentially an agricultural country. It exports the products of its fields and imports industrial goods. Fully eight-tenths of its exports consist of cereals, part of which was supplied to the Central Powers before the outbreak of the European War. The participation of Turkey in the hostilities cut off Rumania completely from intercourse with France and her allies, as the Dardanelles route was blocked. With Russia herself carrying an unprecedented surplus of cereals, Rumanian agricultural products naturally found their way to Austria and Germany when the demand was keenly felt.

But if Rumania found a market for her cereals in Teutonic countries, her attempts to become a country exporting live stock were thwarted by the high tariffs raised by Austria-Hungary against Rumanian hogs and cattle. The Rumanian farmer therefore entertained a grievance against the government of the Dual Monarchy, and the country's determination to fight must be considered in part as an attempt to break through this foreign economic bondage.

Rumania's most pressing industrial needs, consisting of coal and steel products, could likewise be supplied by the Teutonic Powers. Russia, the only member of the Entente which Rumania can reach by direct communication, cannot purvey to Rumania on account of her own needs. Without German coal, Rumania's small but thriving industrial activity faced complete cessation until the end of the war. This dependence of the eastern Latin state on the countries of Central Europe became inevitable with the closing of the Dardanelles seaway and the Bulgarian land routes.

Prior to the European War, approximately 64 per cent of Rumania's imports came

from Germany and her allies as well as from Belgium. The value of this trade amounted to about $77,000,000. From the Entente countries Rumania imported about $38,000,000 worth of goods; 56 per cent of its exports, valued at $79,000,000, went to the Teutonic group. The Allies' share was 24 per cent, representing $34,000,000. The balance found its way to Egypt, Gibraltar, Holland, and Belgium. It is interesting to note that the bulk of Rumanian wheat in the years 1911 to 1913 was directed to Belgium, whence it was reshipped to English and German localities of consumption.

Rumania's intercourse with Russia is necessarily limited on account of the identity of the economic conditions prevailing in both countries. The requirements of both countries are likewise similar. As long as Rumania's maritime commerce with Italy and France is hindered by the closure of the Turkish straits, the country will naturally turn to Central Europe for commercial exchange. But Rumania's entry into the war indicates that the Entente Powers have either succeeded in finding means of supplying her with industrial products, through the great improvement in Russian rail communication of the past two years, or else it is a sign that the Russian staff, working in conjunction with the Allies' forces in the Balkans, foresees the possibility of establishing maritime communication with Europe, by the Aegean, after having forced a way through Bulgaria.

AFRICA

The Position of the Suez Canal in World Politics. The repeated efforts of Turco-German armies to wrest the Suez Canal from British hands have awakened widespread comment in German periodicals. The *Geographische Zeitschrift* in its February number contains an article on this subject by Arthur Dix (Die verkehrspolitische Bedeutung des Suezkanals, Vol. 22, No. 2, pp. 87-91) in which the value of the waterway to England is explained. According to this writer over a fourth of the total British tonnage on sea passed through the Suez Canal in 1912. The traffic by nationality for that year is given as follows:

NATIONALITY	NUMBER OF VESSELS	TONNAGE
British	3,335	12,840,000
German	698	3,025,000
Dutch	343	1,240,000
Austrian	248	814,000
French	221	799,000
Italian	143	368,000
Russian	126	364,000
Japanese	63	320,000
Danish	45	139,000
Swedish	38	138,000

In value also about the same proportion exists between the total British export trade and the amount routed via Suez. The figures are given as 26.8 billion marks ($6,700,000,000) and 6.3 billion marks ($1,575,000,000) respectively. It is pointed out that the loss of the Suez Canal cannot be conveniently offset by the possibility of sending freight via Panama or the Cape routes. The cost of transporting is raised considerably by the increase in time and fuel consumption. It would affect England seriously, because a considerable quantity of its imported raw products are derived from India, the Far East, and Australia.

The Bagdad railway, controlled by Germany, and German East Africa are considered the two great rivals of the Suez Canal. When completed the Turkish line will provide Central Europe with a direct land route to the Persian Gulf and India. The traffic of the Suez Canal may be reduced somewhat by the operation of this new line. The German East African colony lies in the path of traffic directed towards Suez from an important portion of Africa. Moreover, it occupies a position from which it can threaten the Sudan. In a perhaps somewhat far-fetched vision the German writer attributes British possession of the Sudan and Uganda to the desire to reinforce the hold obtained at Suez.

All this explains the continued attempts on the canal, the recent one, early in August, having been thwarted like its forerunner in February. A successful attack at this vital spot of the British Empire would jeopardize both England's and her allies' chances of success in the present conflict. It is impossible to realize exactly the nature of preparations made by the British staff east of the waterway, but the recent rebuff of the Turks increases the probability that practically impenetrable lines have been constructed. The region is not as flat as is generally believed. Its surface is undulating, and the difference in levels is sufficiently pronounced to make it convertible into a strongly fortified

area. Of the three routes leading towards the canal from Turkish territory, the northernmost, running behind the sand-dunes of the Mediterranean, is alone well supplied with water. To the south lack of water is a hindrance to the movement of large bodies of men.

The Past and Present Water Supply of Cyrenaica. In the *Geographical Journal* for May, Professor J. W. Gregory presents a valuable and interesting discussion of the resources and prospects of Cyrenaica (modern Barca), the plateau on the north African coast opposite Greece which was a flourishing region during antiquity. The vital question is whether the climate is now the same as in the days when Cyrenaica was "an earthly paradise." Even within the last century travelers visiting the country in rainy years have described it as like an English park, but according to Professsor Gregory, it is "an arid, karst-land horst" with "a deplorably limited water supply" and only slight prospects of development. Yet he holds that the climate is now the same as when "the plateau produced abundant crops of corn; its coastal plains grew rice and dates; . . . . and its citizens proved famous for intellectual power and physical prowess." As a necessary corollary he believes that the *silphio*, a medicinal plant once held in high esteem, must "have been deliberately exterminated in ancient times."

Fortunately Professor Gregory employs concrete figures. Take, for example, Cyrene with its ancient wall about four miles in circumference and its cemeteries of unparalleled extent. Its springs, as measured by Professor Gregory's party in the summer of 1908, yield "only a paltry 84,000 gallons a day," while its reservoirs, which were dry in 1908, have a capacity of only one and a half million gallons. On the basis of this water supply he estimates that the population of Cyrene cannot have been more than 15,000 to 25,000. This allows ten gallons per day per inhabitant; but deducting the "water that would be used for cattle and stock and irrigation, ... the amount . . . . left for personal use would be only two or three gallons."

Mr. D. G. Hogarth, in discussing the paper, says that we have "singularly good authority that the city of Cyrene had a population of over 100,000 persons." He suggests that the discrepancy between the present water supply and the past population may be because there were many slaves in ancient Greek cities, and they used less water than freemen. If we accept Professor Gregory's figures as to water supply and Mr. Hogarth's as to population—the points in which the two men are respectively authorities—the present water supply would in ancient times have sufficed to give only about two and a half gallons per day per person for all purposes, or one fourth as much as Professor Gregory considers necessary. Moreover the rainfall at Benghasi, the nearest place with a record, averaged only 11.1 inches from 1891 to 1905. At similar places in the United States the rainfall often declines to only 5 or 6 inches. This would not suffice to fill the reservoirs at Cyrene, and the water supply from the springs alone would be scarcely one gallon per person. A great city, whether slave or free, could scarcely exist when frequently confronted by such conditions for months or even years.

ELLSWORTH HUNTINGTON.

ASIA

Activities of an Anthropological Expedition in Arctic Siberia. We are now able to outline the work of the anthropological expedition to Siberia under the joint auspices of the University of Pennsylvania Museum and the Oxford Committee for Anthropology, to which reference was made in the December, 1915, *Bulletin of the American Geographical Society* (p. 960). The headquarters of the expedition were established at the head of the estuary of the Yenisei River, 400 miles below the extreme limit of the great forest belt. Camp was reached down-river by a small paddle-wheel steamer brought there thirty years ago by the Captain Wiggins who reopened the northern trade route through the Kara Sea, a route, it will be recalled, that has been the subject of much comment during the last year. Good opportunities were found for the study of the Samoyedic and Dolgan tribes that frequent the coastal lands of western Siberia. The latter, described as Yakutized Tungus, roam over the country between the upper Khatanga and the mouth of the Yenisei. Much material was collected on the shamanism that still permeates the culture of these peoples of reindeer civilization. The oldest racial element in the lower valley was found to be the Yenisei Ostyak, now limited to the country immediately above the river settlement of Turukhansk. This people represents the fast-disappearing remnant of a fair-haired, blue-eyed stock, the major part of which, dwelling to the south, has been absorbed by Turkic invaders.

The expedition wintered among the Tungus of the Limpiisk tundra, east of the Lower Yenisei valley. These people are less dependent on the reindeer than the

Samoyeds. They are energetic hunters and fishers. On the return journey the expedition devoted a short time to a study of the *kurgani*, or burial mounds, of the Abakan steppe. The so-called Tatars dwelling on the steppe have been considerably affected by Russian influence. Not a few have abandoned nomadism for agriculture. (H. U. Hall: The Siberian Expedition, *Univ. of Pennsylvania Museum Journ.*, March, 1916, pp. 27-45.)

Reforestation in China. The *Review* called attention in its April number (pp. 301-302) to afforestation undertaken in China for the purpose of protecting bare hills and plains. Further news of this work is gathered from communications sent by the College of Agriculture and Forestry at Nanking. By means of circulars to Chinese provincial governors, chambers of commerce, and leading newspapers, the institution is calling attention to the dangers of agricultural insect pests and fungus diseases. The practical character of its labors is thus laid before the Chinese, who, in many instances, have shown appreciation. A significant step was taken by the Ministry of Agriculture and Commerce at Peking in 1915, when all the students of its forestry school were transferred to Nanking for training.

The varied activities of the Nanking forestry school comprise the systematic development of the native fruit industry. The Chinese have no general knowledge of the valuable varieties. Neither do they know which districts in their country are best suited for these. Valuable knowledge is being disseminated among them through the co-operation of missionaries. These devoted pioneers of Western ideas also render great assistance by giving reliable information about the districts with which they are familiar.

Perhaps the most significant proof of the Chinaman's awakening to the importance of his forests is revealed by a recent decision of the Chinese Minister of Agriculture and Commerce which calls upon the Chinese to observe Arbor Day. According to a recent issue of *Commerce Reports* (May 26, 1916, p. 765) five thousand magistrates in the country were instructed to invite the people of their respective districts to plant trees on that holiday. The example was given to the nation by the minister in person, who, on April 6, the occasion of the "Ching Ming" national holiday, went to the hills west of Peking in company with officials of his department and of the School of Forestry in order to plant a number of trees. The conversion of the "forestless" nation into a country containing an important acreage reserved for trees of commercial value, will, it is hoped, be marked by these beginnings.

Tachienlu, the Chinese Gateway to Tibet. For centuries Tachienlu (30° N. and 102° E.) has been the main gateway into Tibet. The highroad that runs through it from Pekin via Lhasa to Leh in Cashmere has permitted the western flow of Chinese conquest, trade, and civilization. Tachienlu marks the natural boundary to this spread. It is situated on a line of geographical and ethnological cleavage: eastward the country is in all respects Chinese, westward it is Tibetan save for the sprinkling of Chinese officials and traders. The town is a trading center, for its location defines not only a change in products but also in transportation. Goods from Yachow, the western depot of Szechwan, are carried by coolies to Tachienlu: there transport for the high plateau is exchanged to yak, mule, or pony. Apart from a small local and retail trade, business is transacted between the Chinese firms of Tachienlu and the Tibetan merchants coming in with their annual caravans. Goods are chiefly obtained by barter, but a few merchants are buyers or sellers only. The former pay in gold dust or in the Chinese rupee, a coin specially minted for frontier use, and the latter accept the rupee or silver. Exceptionally one or two merchants of high credit remit their accounts direct to Shanghai via India. The principal trade of Tachienlu is in brick tea, an item that during an average year accounts for some $700,000. It is controlled by a system of licenses issued by the provincial government and distributed by the Tea Guild under what are practically monopoly conditions. Revenue from the sale of licenses is now devoted to frontier administration. Since 1910 Tachienlu trade has shown a decline. Tibet has been supplied with tea to some extent by India, by trade channels that are almost certain to develop at the expense of the Chinese route (Report for the Year 1913 on the Trade of Tachienlu, *Diplomatic and Consular Repts.*, Ann. Series, No. 5561, London, 1916).

Disputed Sovereignty over a Philippine Island. From a Dutch source (*De Indische Gids*, Vol. 37, 1915, No. 12, p. 1754) comes the information that the sovereignty over Palmas, or Miangas, Island, a small island in 5°35′ N. and 126°35′ E., southeast of Mindanao, is in dispute between the governments of the United States and the Netherlands. While its position places it within the limits of the islands ceded by Spain to the United States according to the Treaty of Paris of 1898, the proximity to

their East Indian possessions seems to have prompted the Dutch to claim it. The fact that the Dutch have made the only available survey of one of its anchorages (see inset on U. S. Coast and Geodetic Survey Chart No. 4724) attests their interest in the island. The dispute is, according to a recent Dutch "orange" book, to be settled by arbitration.

POLAR REGIONS

Rescue of the Marooned Men of Shackleton's Weddell Sea Party. Shackleton's repeated efforts to rescue the twenty-two men who were left stranded on April 24 on Elephant Island in the South Shetland group, as related in the July *Review* (p. 56), have at last been crowned with success. A brief cablegram from Shackleton dated Punta Arenas, September 3, says that all the men have been saved and that all are well.

Details of the rescue are given in a cablegram from Shackleton to the *New York World*, published in its issue of September 5. On this, the fourth attempt, a course was set to approach Elephant Island from the northwest, as Shackleton hoped the ice would have worked toward the northeast. This hope was realized and, on August 30, after steering in the fog through the numerous stranded bergs, the camp of the marooned party was reached at 1 P. M. All were well, and an hour later they were homeward bound.

The men had endured many hardships since Shackleton left them on April 24. The day after his departure the island was beset by dense pack ice. The party was confined to a narrow spit of land 250 yards long and 40 yards wide surrounded by inaccessible cliffs and ice-laden seas. The party was forced to abandon the ice hole in which they had first taken refuge; they made a dwelling of their two boats, supported by rocks and set up as far as practicable from the sea. The weather continued appallingly difficult to work in, and the vitality of the whole party was lowered owing to exposure.

In May a heavy blizzard swept much valuable gear into the sea, and there was great danger that the men themselves would be swept away by the heavy seas. Fortunately, owing to the low temperature, an ice foot formed on the seashore, and this protection was the means of saving the party from total destruction. On several occasions the adjacent glacier calved, throwing up heavy waves, and on one occasion blocks of ice were hurled to within fifteen feet of their dwelling.

Realizing what difficulty Shackleton would have to reach them, Frank Wild, in command of the party, took drastic measures to insure a sufficient food supply. At first only one meal was allowed daily, until the reserve of blubber had been increased. The special rations were only used for two meals weekly and supplied a vital change in the diet. The meat supply, which was greatly depleted, was periodically replenished by small penguins. No seals could be killed after the May blizzard, as they were unable to land because of the ice foot. At the beginning of August, the men were able to collect seaweed and limpets, which formed a valuable change in their diet. Thus life was successfully maintained.

From June on the weather was better as regards wind, but the party was under a constant pall of fog and snow. In the middle of the winter the toes of one of the men had to be amputated. Whenever the sea opened, the men's hopes of relief were renewed. Shackleton's three previous attempts at relief, it develops, had synchronized with times when the island was beset by ice. The fourth attempt was successful because on August 28 a gale had driven the pack from the island.

Of the four attempts undertaken by Shackleton to reach his stranded companions, the first was made from South Georgia on May 23 in a whaling vessel furnished by a Norwegian whaling station. The boat was unable to penetrate the pack ice and so made for the Falkland Islands, arriving at Port Stanley on May 31. It was from here that Shackleton telegraphed an account of the drift and fate of the *Endurance* (see the July *Review*, pp. 54-57, with map). The second attempt was begun on June 8 when the steamer *Instituto Pesca* of the Uruguayan Bureau of Fisheries left Montevideo, stopping en route at Port Stanley on June 17 to pick up the explorer. On June 25 the attempt was abandoned, as it was impossible to reach Elephant Island because of the ice. The ship had been able to approach within twenty miles, however, and it had been ascertained that penguins abounded on the island. This made it seem probable that the men would be able to subsist until help came, although they had only five weeks' rations with them. On July 13 Shackleton made a third attempt, sailing from Punta Arenas on the schooner *Emma*. This trip, too, was a failure. The schooner was forced back by heavy gales and ice fields and, with engines injured and hull battered, put back to the Falkland Islands on August 4. The final and successful trip was begun on August 26 from Punta Arenas on the Chilean government steamship *Yelcho*, which on the previous attempt had been used to tow the *Emma* as far as possible on

her way. Had this last trip been unsuccessful, Shackleton would have gone south in the *Discovery*, Scott's old vessel, which was being fitted out in England by the British government for the purpose.

The rescued men include: Frank Wild, second in command of the expedition and commander of the party on Elephant Island; James Wordie, geologist; Leonard H. Hussey, meteorologist; R. W. James, physicist and magnetician.

This rescue will remain noteworthy in the annals of Polar exploration. Only the leader's energy and perseverance and the endurance of the marooned party could have turned aside the impending disaster. It is to be hoped that similar good fortune awaits the ten other members of the expedition in the Ross Sea region, who have not been heard from since May 6, 1915.

Return of the Southern Party of the Stefansson Expedition. The arrival of the power schooner *Alaska* on August 15 at Nome, Alaska, with the members of the southern party of the Stefansson expedition on board, was announced in the daily press of August 17. The expedition, it will be recalled, was divided into two parties, the northern, under Stefansson himself, and the southern, under Dr. R. M. Anderson. The fortunes of the northern party were recounted in the July, 1914, and October, 1915, numbers of the *Bulletin of the American Geographical Society*.

The *Alaska* left her two years' station at Bernard Harbor on Dolphin and Union Strait, between Victoria Island and the mainland, on July 13, 1916, and reached Herschel Island off the Mackenzie estuary on July 28. She then proceeded westward along the Alaskan coast and southward to Bering Strait until she reached Nome. The following members of the scientific staff returned on the *Alaska:* Dr. R. M. Anderson, executive head of the southern party, geologist; J. J. O'Neill, geologist; J. R. Cox, topographer; D. Jenness, ethnologist; F. Johansen, naturalist. K. G. Chipman, chief topographer, is returning by way of the Mackenzie River.

The following account of the activities of the party which covered the Arctic mainland coast of Canada from Cape Parry (124° W.) to Bathurst Inlet (108½° W.), is based on a cablegram from Doctor Anderson published in the August 17 issue of the *New York Times*.

During 1915 Chipman and O'Neil made a detailed survey of the coast from the Cape Parry peninsula to Stapylton Bay (116½° W.); from here Cox carried it on as far as the Rae River, at the western head of Coronation Gulf. This hitherto unexplored river was surveyed for about seventy-five miles above its mouth, and a traverse was made overland to Stapylton Bay to ascertain the geology. Later Cox and O'Neil continued eastward along the southern shore of Coronation Gulf, surveying the region about Port Epworth (112½° W.) and the Kogluktualuk (112° W.), a large river with many waterfalls. In August and September the coast east from Cape Barrow (111° W.) around Moore Bay (110½°), Arctic Sound, and Hood River (109½°) and part of Bathurst Inlet were surveyed in detail topographically and geologically. These surveys were completed in the spring of 1916 and the remainder of the coast west of Cape Barrow filled in. They will considerably rectify our present maps of the Bathurst Inlet region, which go back to Sir John Franklin's hurried voyage in 1846. For instance, over one hundred and fifty islands were mapped in the region at the western side of the entrance to the inlet, where three large islands, Chapman, Lewis, and Marcet, have heretofore been indicated. The geological investigations, the main work of the party, were very encouraging. In addition to the known occurrences a large new field of native copper was mapped and studied.

Complete meteorological records were kept for three years continuously. Tidal observations were made during the winter in Dolphin and Union Strait, as well as deep-sea dredgings and soundings here and elsewhere. About one thousand specimens of birds and mammals were brought back. Numerous photographs and cinematograph pictures of native life, natural history objects, and scenery were taken.

In ethnology, Jenness did valuable work, some of which is mentioned in the note immediately below. From April to November, 1915, he sledged and packed with the primitive Eskimos in the interior of Victoria Island. Returning over the ice to the mainland, he made extensive ethnological and archeological collections, including one hundred phonograph records of folklore. The manners, customs, and games of the Eskimos were studied.

Doctor Anderson's cablegram also told of the activities of the northern party of the expedition and of Stefansson's plans. The *Mary Sachs* was hauled up on the beach at Cape Kellett, Banks Island, in charge of Captain Bernard and an Eskimo crew for a reserve station. The *North Star* was unable to proceed farther north than a small unnamed island north of Robilliate Island, west of Banks Island, and was also hauled up safely as a base for ice trips. Her crew joined the *Polar Bear's* exploring parties.

The *Polar Bear*, in charge of Stefansson, made an unsuccessful attempt to sail up the west side of Banks Island in 1915. She wintered near Princess Royal Island, Prince of Wales Strait, between Banks and Victoria Islands. The death of several dogs prevented a projected ice trip to Beaufort Sea. But the main work of the party was to be the exploration of the newly discovered land north of Prince Patrick Island (see the October, 1915, *Bull. Amer. Geogr. Soc.*, pp. 766-769). The party left for this trip in May to remain in the field as long as conditions would permit. If the coast of the new land turned southwest and it seemed possible that no land existed in Beaufort Sea within sledging distance of Banks Island or Prince Patrick Island, the party would endeavor to return in 1916. But from the location of the vessels and the scattering of the various parties it is hardly thought probable that the northern party will return this year. The explorers are well supplied for another year or two with staples, which are supplemented by musk-oxen and other game.

Explorations in Victoria Island. Word has been received of the safe return of Mr. Diamond Jenness from Victoria Island after a season's work with the Eskimos. Mr. Jenness is ethnologist of the southern party of the Canadian Arctic Expedition. His plan of work is outlined in a report by Dr. R. M. Anderson (*Summary Rept. Geol. Survey of Canada for 1915*, Ottawa, 1916, pp. 228 and 230). The party started with a family of Eskimos on April 13, 1915, about the time the barren-ground caribou began to migrate in numbers from the mainland across to Victoria Island, and planned to follow the migration north across Wollaston Peninsula (for locations, see map accompanying "Victoria Island and the Surrounding Seas" by Vilhjalmur Stefansson, *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, pp. 93-106). Thence they were to journey to Lake Tahieryuak in the interior or west-central part of Victoria Island and, after gathering ethnographic material concerning little-known groups of Eskimo, return in the autumn, following the caribou southward.

Though no report other than that in the preceding note is yet available on this latest work, important records may be expected, for Mr. Jenness had already made many trips among the Eskimos of the region. Doctor Anderson reports that Mr. Jenness' studies along the coast in the region of the winter station have resulted in important discoveries in relation to Eskimo migrations, tribal distinctions and limits, customs, and language.

PHYSICAL GEOGRAPHY

A Graphic Record of Weather. A simple method of keeping a graphic record of daily weather has many advantages over the usual written description. Mr. E. T. Quayle, assistant in the Commonwealth Bureau of Meteorology of Australia, has recently described a simple scheme for a graphic record which he has used satisfactorily for over twenty-five years. The record deals chiefly with cloud types and their amounts, movements, and changes, but includes also winds, rain, and electrical and other phenomena. The time (hour of the day) is shown along a horizontal line, and the cloud levels are indicated vertically. The cloud forms are represented as seen in section, or as they would appear on the horizon. The level to which the cloud belongs is indicated by the height of its position on the vertical scale of the diagram. The amount of cloud and its duration are partially suggested by the way the stratum is broken, or by the addition of a figure to show a numerical estimate. The rate of movement may be shown by different amounts of feathering on arrows which show the direction of movement. Wind directions are indicated by arrows at the bottom of the diagram. Rain, lightning, etc., are suggested by conventional symbols or by sketches. Short supplementary notes may be added when necessary. The illustrations of this method of keeping a graphic weather record, given in Mr. Quayle's report, show the value of the scheme in presenting at a glance a vivid and interesting picture of each day's weather (E. T. Quayle: A Graphical Method of Showing the Daily Weather, especially Cloud Types, *Commonwealth Bur. of Meteorol. Bull. 12*, Melbourne, 1916). R. DEC. WARD.

Rainfall Forecasts and Wind Directions. The "patchiness" of rainfall, both as to distribution and amount, in our ordinary cyclones is a well-known fact and one which often makes weather forecasting a difficult matter. Mr. H. H. Clayton, chief of the forecast division of the Argentine Meteorological Office, has approached this difficulty from the forecaster's side and has presented some new and interesting facts. The ascent of air, resulting in rainfall, may be induced by (1) topography; (2) heating at the earth's surface, which determines the formation of local ascending currents resulting in cumulus clouds and local showers; (3) converging or opposing winds, determined by horizontal differences of temperature and pressure. While both (1) and (2) must be kept in mind by the forecaster, the third is the main cause of our ordinary

rains. When winds are diverging, a descent of air and fair weather are indicated. When winds are converging, ascending air is indicated, accompanied by expansion, cooling, and condensation. The intensity of rainfall is determined by (a) the angle of convergence, (b) wind velocity, (c) moisture of the air, (d) topography. Mr. Clayton's method in forecasting is to predict the pressure distribution for the following day, to draw in the inferred wind arrows, and then to locate the areas of converging and of diverging currents. The former are then marked as rainfall districts. When the relative humidity is low (60% or less), rain does not result from converging winds, and the rain areas are there omitted (*Monthly Weather Rev.*, Vol. 44, 1916, pp. 80-81).

R. DEC. WARD.

HUMAN GEOGRAPHY

History and Geography: The Nature of Their Relation. A note of warning against exaggerating the relation between geography and history is sounded by Brunhes in his introduction to the second year's (1913-1914) course in human geography at the Collège de France (Jean Brunhes: La géographie de l'histoire, *Rev. de Géogr. Annuelle*, Vol. 8, 1914-15, pp. 1-71). According to this eminent investigator, all history does not proceed from geography, neither does history always repeat itself when enacted on the same physical stage. In other words the element of period, i. e. of time and of changing conditions, must also prevail. A strictly mathematical interpretation of the influence of geography on history is therefore impossible. The very essence of the relation requires the utmost latitude in its applications. A characteristic custom, facts of a social character, economic or political, for example, can generally be made to fit within geographical frames. Persistence of the relation in time or space, however, does not necessarily ensue. The mistake that is often made consists in an attempt to prove the continuity of interactions which in reality are exceedingly variable in character.

To illustrate Brunhes's idea, mention may be made of the minarets in Bosnia-Herzegovina, cited by him. Bosnia is a well-forested region, while Herzegovina is characterized by broad plateaus of bare limestone. Wooden minarets prevail in the former province. In the latter they are built of stone. We have here differences evidently due to geography. But the influence of the land does not end with the material used in the construction of minarets. The shape or rather the type of minaret is also determined by this material. The wooden minaret ends in the form of a circular terrace roofed over by a wooden reproduction of an enlarged Malaysian hat. In the stone minaret the balcony is placed as a ring at mid-height, the structure being prolonged shaft-like to taper into a point.

It would appear at first glance as if the relation ended here. Nevertheless in recent years the stone minaret tends to replace its wooden variety of type throughout richly wooded Bosnia. The change is economic and based on human experience. The stone structure has been found to be more enduring. It is less subject to destruction by fire, and the deterioration due to rain is trifling. Therefore in all the large cities of the wooded belt—Sarayevo and Jajce are given as examples—the minarets of recently built mosques are built of stone. The course of normal evolution in geographical influences is suggested by this example of the transition from a blind to an intelligent response to environment, the latter term being taken in the sense of a constantly broadening field as man's conquest of distance and of transportation facilities becomes more thorough.

GEOGRAPHICAL NEWS

The Physiographic Committee of the U. S. Geological Survey. Through the courtesy of the Director of the U. S. Geological Survey, we are now able to amplify the brief announcement made in the February *Review* (p. 367) to the attention henceforth to be paid to physiography by the Survey in its work. The Chief Geologist, David White, recently made provision for the utilization of physiographic work done in connection with geologic investigations and for the directing and systematizing of physiographic research generally by a standing committee. For this purpose the Physiographic Committee, which has been in existence for several years, has been reorganized and given definite duties. It now consists of the following members: M. R. Campbell, Chairman, F. E. Matthes, O. E. Meinzer, E. W. Shaw, and Philip S. Smith. Its duties, as outlined by the Chief Geologist, are:

(1) To read and pass critically and advisorily upon physiographic papers or physiographic chapters or sections in other papers submitted for publication by the Survey.

(2) To consider the classification and nomenclature of physiographic provinces.

(3) To prepare or make recommendations for the preparation of physiographic descriptions, in popular language, to be printed on the backs of topographic maps.

(4) To consult with geologists regarding the solution of physiographic problems.

(5) To formulate the usage of physiographic terms, in continuance of the work of the old committee.

(6) To confer with chiefs of section and with the Chief Geologist regarding physiographic work to be undertaken by the Survey.

It is to be hoped that physiographers and geologists throughout the country will confer freely with the committee upon any subject that may properly come within its sphere of activities, but especially regarding uniformity of usage and greater exactness of definition of physiographic terms. The committee expects to take up, from time to time, as opportunity offers, those terms which have been used loosely or used in more than one sense, and to endeavor to formulate definitions which will be acceptable to the majority of physiographers. In framing these definitions special weight will be given to the following factors: (1) etymology and literal meaning of the word, (2) priority of use, (3) currency of use, (4) avoidance of the use of more than one word to express a single idea, (5) avoidance of the use of any word in more than one sense, and (6) exactness of definition, especially in delimiting features or processes which are closely related or which merge one with another.

After the definitions have received the provisional approval of the committee, it is proposed to send copies of the argument and decision to physiographers and geologists of recognized authority for their consideration. If the decision is generally approved, the findings of the committee will doubtless be adopted by the Geological Survey, but, should there be much disagreement, the committee will reconsider the question.

It is hoped by this procedure to determine the best usage, to make definitions more exact and unequivocal, and to secure greater uniformity of usage, not only in the Geological Survey but also among physiographers and geologists outside of that organization.

PERSONAL

DR. CHARLES C. ADAMS has been appointed to the professorship of forest zoölogy in the newly formed department of zoölogy at the New York State College of Forestry of Syracuse University.

PROF. EDWARD W BERRY of the geological department of Johns Hopkins University has been doing work in Mississippi and Texas for the U. S. Geological Survey during the summer.

MR. WILLIAM BOWIE of the U. S. Coast and Geodetic Survey has recently been appointed a member of the United States Permanent Commission of the International Geodetic Association.

MR. CARL CHESWELL FORSAITH has been awarded the second Walker Prize, offered by the Boston Society of Natural History, for his essay on "The Relation of Peat Deposits to the Formation of Coal."

DR. WILLIAM H. HOLMES, chief of the Bureau of American Ethnology, has been made Corresponding Associate of the Academia Nacional de Historia of Colombia.

DR. ALEŠ HRDLIČKA of the United States National Museum has been made Corresponding Associate of the Academia Nacional de Historia of Colombia.

DR. OTTO KLOTZ, Dominion Astronomer, Ottawa, received the honorary degree of Doctor of Laws at the commencement of the University of Pittsburgh in June.

PROF. E. M. LEHNERTS of the department of geography of the University of Minnesota has succeeded D. Lange as president of the Minnesota Forestry Association.

PROF. B. E. LIVINGSTON of the department of botany of Johns Hopkins University read a paper on "A Quarter-Century of Growth in Plant Physiology" at the quarter-centennial celebration held at the University of Chicago, June 2-6.

DR. F. J. H. MERRILL, from 1899 until 1904 state geologist of New York, has moved to Los Angeles, where he will resume consultant practice in geology and mining engineering.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the July number, pp. 77-81

NORTH AMERICA

UNITED STATES

North Atlantic States

MCILWAIN, C. H., edit. **An abridgment of the Indian affairs, contained in four folio volumes, transacted in the colony of New York, from the year 1678 to the year 1751, by Peter Wraxall.** xxxiv and 251 pp. (Harvard Historical Studies, Vol. 21.) Harvard University Press, Cambridge, 1915. $1.80. 9 x 6.

Indian affairs between 1678 and 1751 were based largely on trade in beaver pelts, and the extermination of the beavers in the neighborhood of the settlements extended the trade into remote and foreign territories with consequent international complications. It appears that it was not a demand for beaver furs that inspired the trade between the colonies and the Indians but rather a desire for trade by means of which a political alliance with the Indian tribes might be attained. The record of thousands of skins burned so as not to glut the market is significant. The competition for Indian trade lay between the French and the English and, as English goods were cheaper than the French, the Indians could get twice as much for the skins at both Albany and Oswego as they received at any of the French posts. Because the center of distribution of the English goods lay directly in the Iroquois country, the Iroquois were easily won to an alliance, and later, when the trade was extended, they became the middlemen between the distant Indian tribes and the English. The fur trade was America's great conservation problem of the eighteenth century, but there was no conservation of beaver and no effective regulation of trade, mostly, no doubt, because of political motives. The records of the dealings with the Indians have, even for a reader of this day, very familiar phrases which can be traced to their similarities to "dollar diplomacy." At the same time the "eagerness to engross the trade" of the Indians probably led to more flagrant evasions of law and order than can be charged against the American people since.

Such in brief is the story of this book. The editor in the first 110 pages explains the background of the records, furnishes the reader with accounts of the early fur trade in the north and south and especially in New York, shows the attempts at the regulation of the fur trade, and adds a history of the New York Indian records and a brief sketch of Wraxall. Then follows (250 pages) a copy of the abridgment of the New York Indian records. ROBERT M. BROWN.

ABBOTT, A. P. **The Hudson River today and yesterday.** 85 pp.; map, ills. Historian Publ. Co., New York, 1915. 7½ x 5. [Good panoramic views of both banks. Text not free from inaccuracies, e. g. concerning origin of "Spuyten Duyvil."]

CLELAND, H. F. **Geological excursions in the vicinity of Williams College.** 67 pp.; maps, diagrs., bibliogr. Williamstown, Mass., 1916. 7½ x 5.

JOHNSON, CLIFTON. **Highways and byways of New England.** (Series: American Highways and Byways.) xii and 299 pp. The Macmillan Co., New York, 1915. $1.50. 8 x 5. [Homely bits of local color.]

LANDRETH, O. H. **Water resources of New York state.** *Journ. of the New York State Forestry Assoc.*, Vol. 2, 1915, No. 4, pp. 17-19 and 48. Syracuse, N. Y.

MIDDLETON, JAMES. **New York, the stupendous.** Ills. *World's Work*, Vol. 31, 1916, No. 5, pp. 538-554. [The population of the political entity known as New York exceeds by a million that of the political entity known as London.]

NEWLAND, D. H. **The quarry materials of New York—granite, gneiss, trap and marble.** 212 pp.; maps, diagrs., ills., index. *New York State Museum Bull. No. 181.* Albany, 1916.

—— **New York's advantages as a free port.** Map, ills. *Dun's Rev.: Internatl. Edit.*, 1916, May, pp. 35-38. [Urges the establishment of a free zone near the city.]

PERKINS, G. W. **The Palisades Interstate Park.** Ills. *Amer. Museum Journ.*, Vol. 16, 1916, No. 3, pp. 201-207. [Notes from an address before the members of the American Scenic and Historic Preservation Society and the American Museum of Natural History, Jan. 21, 1916.]

STOLLER, J. H. **Glacial geology of the Saratoga quadrangle.** 50 pp.; maps, diagrs., ills., index. *New York State Museum Bull. No. 183.* Albany, 1916. [With geological map, 1:62,500, of the Saratoga quadrangle.]

STRUNSKY, SIMEON. **The city's ragged edges.** Ills. *Harper's Mag.*, No. 789, Vol. 132, 1916, Feb., pp. 436-447. [Bright sketch, with pleasing illustrations, of what Baedeker's "United States" fittingly terms "the unkempt environs of New York."]

—— ***Chateaugay, New York, sheet.*** [***Topographic map of the United States.***] 1:62,500. Surveyed in 1912-1913; edition of Sept., 1916. U. S. Geological Survey, Washington, D. C. [Chateaugay chasm is a good example of a young stream valley carved since the Glacial Period by a river forced out of its former course by the ice. The absence of roads and abundance of forests in the southern, mountainous part of the map is in strong contrast with the frequent roads and prevalence of cleared lands on the plains to the north.—D. W. J.]

EUROPE

GENERAL

BENEZET, L. P. **The story of the map of Europe: Its making and its changing.** (Series: The Lake History Stories.) 277 pp.; maps, ills., index. Scott, Foresman & Co., New York [1916]. 60 cents. 7½ x 5. [Vivid survey of the history of Europe from its beginnings to January, 1916, with emphasis on racial and nationalistic phases. The book is intelligible to grammar-school pupils, without losing in acceptability for adults, because of its sustained interest and fascinating style. There are numerous ethnographic maps and maps of territorial changes: these would gain in value by being correct in geometrical outline.]

COOPLAND, G. W. **The Franco-Belgian frontier.** *Geogr. Teacher*, No. 44, Vol. 8, 1916, Part 4, pp. 266-270.

LAMERS, J. M. **De posterijen, telegrafie en telefonie tijdens den Europeeschen oorlog.** *Vragen van den Dag*, Vol. 31, 1916, No. 4, pp. 257-277. Amsterdam.

SPICER, E. C. **The French and German borderlands.** Maps, diagr., bibliogr. *Geogr. Teacher*, No. 44, Vol. 8, 1916, Part 4, pp. 260-266.

WARD, R. DEC. **The weather factor in the great war, III: May to October, 1915.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 3, pp. 71-76. [The third article in a series of which the first two were published in *Pop. Sci. Monthly*, Dec., 1914, and *Journ. of Geogr.*, Feb. and March, 1915.]

SCANDINAVIA, INCLUDING FINLAND

DRACHMANN, POVL. **The industrial development and commercial policies of the three Scandinavian countries.** Edited by Harald Westergaard. 124 pp,; index. Issued for the Division of Economics and History of the Carnegie Endowment for International Peace by the Clarendon Press, Oxford, 1915. 10 x 7.

The present volume is one in a series of investigations conducted by the Carnegie Endowment in order to ascertain the economic causes and results of war. Yet it does not confine itself to this subject. In convincing form and within small compass it gives an excellent review of the splendid economic development that has taken place in Scandinavia since the middle of the last century, when the three countries recovered from the effects of the Napoleonic wars. Through the efforts of the heath reclamation society the soil of Denmark has been brought under cultivation to an increasing degree until it is estimated that only four per cent of the total acreage is untillable. Various associations with state support have brought farming up to the highest point of efficiency. Though Denmark is distinguished for a few manufacturing industries requiring a high degree of technical or artistic skill, such as the famous oil-burning Diesel motor ships and the beautiful porcelain, the country still remains an agricultural state, but agriculture itself has been industrialized by the co-operative slaughter-houses and dairies.

In Norway and Sweden the recent extraordinary growth of manufacturing has brought the countries face to face with the problem of how to keep the natural resources in the hands of the people, a problem that is the more acute since it is largely foreign capital that is invested. Norway in 1909 passed a drastic concession law, which seeks to guard

the interests of native labor and capital. Its most important clause is that fixing the time limit of the concession of the right to utilize any waterfall of over one thousand horse-power at from sixty to eighty years. After that time the waterfall and power-station with machinery revert without compensation to the state. The law has not yet been in force long enough to judge of its effects. The government of Sweden itself owns and has developed important waterfalls, including that of Trollhättan with 80,000 horse-power and Porjus with 50,000. The state has a contract with the Gröngesberg company which owns or controls most of the Swedish ore mines. By this one half of the net profits of the mines will accrue to the people of Sweden after the year 1932, and the government reserves to itself the right to take them over entirely at a reasonable price. The production up to that time is limited by a government regulation. HANNA ASTRUP LARSEN.

HAMBERG, H. E. **Grandeur de la variation diurne de la température dans la péninsule Scandinave.** 71 pp.; maps. *Bihang till Meteorologiska Iakttagelser i Sverige*, Vol. 54, 1912. Upsala, 1914.

We have too many publications filled with tabulated meteorological and climatic data, and too few discussions of these data. Norway and Sweden have long been doing admirable meteorological work, of an intensive character, and this latest publication is a worthy successor to the many notable contributions to meteorology which have preceded it. Doctor Hamberg's excellent monograph is a type of discussion which ought to be available for many other countries. We have, in this report, a very careful study of the diurnal range of temperature in the Scandinavian peninsula. For Upsala the period of hourly temperature observations is a long one (1866-1910), and for Vassijaure, in Lapland, such observations have been made since July, 1905. Where hourly observations are not available, the periodic diurnal range has been calculated by means of a method suggested by Rubenson in 1876, using the 8 A. M., 2 and 9 P. M. readings. The non-periodic diurnal range, as is generally known, is readily obtained from the readings of the maximum and minimum thermometers. The controls of the diurnal range of temperature, especially the cloudiness, are discussed, and a large number of charts illustrate the monthly distribution of the periodic diurnal ranges and of the periodic diurnal minima. Doctor Hemberg's monograph is too detailed for general reading, but for those who are making a special study of the temperatures of Norway and Sweden and for those who want to know how much of interest and of meteorological importance there is in the diurnal ranges of temperature, this report may be recommended for careful study.

R. DEC. WARD.

—— **Finland, trade of, Report for the year 1914 on the.** 43 pp.; map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5546. London, 1916.

HARTMANN, JULIO. **Memoria annual del cónsul general de Chile en Noruega correspondiente a 1914.** *Bol. de Relaciones Exteriores*, No. 59, 1915, August, pp. 81-98. Santiago, Chile.

JOHANSEN, A. C. **Fünfter Bericht über die Pleuronectiden in der Ostsee.** 104 pp.; maps, diagr., ills. *Rapports et Procès-Verbaux des Réunions, Conseil. Perman. Internat. pour l'Expl. de la Mer: Rapports*, Vol. 22, Art. 2. Copenhagen, 1915. [On the flounders, soles, and similar flat fishes of the Baltic.]

STÖRMER, CARL. **Preliminary report on the results of the aurora-borealis expedition to Bossekop in the spring of 1913 (Third communication).** Maps, diagrs., ills. *Terrestr. Magnet. and Atmospher. Electr.*, Vol. 20, 1915, No. 4, pp. 159-174.

—— ***Finland, Geologisk öfversiktskarta öfver: Sekt. D3, Joensuu.*** 1:400,000. Geologiska Kommission, Helsingfors, 1910.

—— ***Norge, Topografisk kart over kongeriket: Voss sheet.*** 1:100,000. Surveyed in 1861-1865, revised in 1885 and 1911. Norges Geografiske Opmaaling, Christiania, 1888; new edition, 1914. [A beautiful example of the cartographic art for which the Norwegian survey is justly famed, showing with special clearness many of the features of alpine glacial erosion in southern Norway. The sharply incised glacial troughs and glacial notches cut across preglacial divides are particularly interesting.—D. W. J.]

SPAIN, PORTUGAL

BELL, F. G. **Portugal of the Portuguese.** x and 268 pp.; map, ills., index. Charles Scribner's Sons, New York, 1915. 7½ x 5½.

Statements of the customs and religion of a people, descriptions of buildings, essays on literature and historical surveys, all are interesting information to one seeking knowledge concerning any country, but the general run of readers, consciously or unconsciously, prefers a connected story and an elucidation of the character and life of the people.

Now and then a casual reference to sunny skies and irregular topography shows that some geographic relationships could not escape observation, but as a whole this story of Portugal follows a too common style of pure description and is wanting in the deeper study of the principles of national life. While the author devotes a page to climate, the physical environment is as a rule neglected. The book is freely punctuated with foreign names and phrases even at times when the English translation is more expressive. However, it covers a remarkable range of topics and offers glimpses into many corners of the republic, infrequently referred to by most writers. Since Portugal's turn from monarchy to republic is still an overshadowing element in the life of her inhabitants, it is natural that a large share of any story of this country should be devoted to its recent history and politics, the gravity and far-reaching effect of current political changes, and a semi-prophetic glimpse into the future. ROBERT M. BROWN.

BELTRAN Y ROZPIDE, RICARDO. **Geografía: Guía y plan para su estudio, con especial aplicación á la geografía económica. Part 1: Preliminares; La península Española.** 147 pp. Imprenta del Patronato de Huérfanos de los Cuerpos de Intendencia é Intervención Militares, Madrid, 1915. 6½ x 4½.

In the prologue to this volume the author discusses the concept of modern geography, whose content he describes as "study of the earth as the theater of organic, in particular human, life." He re-enforces his concept with quotations from the writings of Davis, Huntington (see *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, pp. 641-652), and Tower (*Bull. Amer. Geogr. Soc.*, Vol. 40, pp. 522-530; Vol. 42, pp. 801-825). Method is discussed shortly, and the remainder of the first part of the projected work is devoted to the Iberian Peninsula. It is treated on a regional basis, emphasis being laid on the economic unit.

HERNÁNDEZ-PACHECO, EDUARDO, AND J. D. CERECEDA. **Geología y paleontología del Mioceno de Palencia.** 289 pp.; maps, diagrs., ills., index. *Comis. de Investigac. Paleontológ. y Prehist. Mem. No. 5.* Inst. Nacional de Ciencias Físico-Naturales, Madrid, 1915. [Sections on the physical geography of the Tertiary basin of the Duero and on the geology of the Palencia region north of Valladolid. Summary in French.]

LOWRIE, W. L. **Portugal.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 11a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

AFRICA

SUDAN AND UPPER GUINEA

FRIEDLAENDER, IMMANUEL. **Beiträge zur Kenntnis der Kapverdischen Inseln: Die Ergebnisse einer Studienreise im Sommer 1912.** xii and 109 pp.; maps, ills. D. Reimer (E. Vohsen), Berlin, 1913. Mk. 15. 10 x 8½.

Means of getting about the Cape Verde Islands are indifferent; so Doctor Friedlaender, who hired a schooner in the summer of 1912 and spent over four months in their exploration, assures us he is the only traveler who has visited all of them.

The islands have no economic significance apart from the coaling depot and trans-Atlantic cable station at São Vicente. Six million tons of shipping called there in 1913, and nine cables land there. One of these days the steamers will burn oil, and a great Marconi station is soon to be erected there. Then what will become of São Vicente?

The reader gets a picture of an easily existing, tropical folk, kindly and courteous, not unhappy in good days nor impatient in bad ones, prolific in offspring, but of low initiative and negligent in matters of morals and sanitation. Leprosy, malaria, and dysentery are common. Negligence in protection of drinking water is extreme. Consumption is rife among the dust-breathing coal heavers, who sleep too many persons in a room, and among the negroes, owing to the practice of wearing clothes that white merchants and clergymen have taught them but that are not suited to the climate and their nature!

Most of the islands suffer from aridity, yet the actual water supplies are not nearly utilized. Short rains bring calamity by famine. In 1903, 22,000 people died of hunger. The main food is maize. Tropical fruits can be easily raised and are cultivated to some extent. Sugar cane does well but is too largely made into rum. Drunkenness follows and tuberculosis. Products of great merit are coffee, fetching the highest price at Lisbon, and *pulgueira*, a plant yielding a lubricating oil that is in great demand at Marseilles. But neither is produced in important amount. And, indeed, why work? Ninety-seven people to a square mile and many miles of stony lavas and ashes, and more of them waterless, suggest ease of life. Of 144,000 inhabitants four per cent are white and sixty-six per cent mulattoes, according to the Statesman's Year Book.

Formerly there were important whale fisheries. Now the whales are gone from that neighborhood. Many of the men are still famous whalers, especially from the island of Fogo, but they work for American ships, and this has brought about much emigration from Fogo to the United States, especially to "the little cities New Bredford [*sic*] and Providence, which are mostly inhabited by former Cape Verde folks!" It is of interest to note that the inhabitants of Fogo are nearly all *black!*

The book is sketchy and has practically no meteorology. It has many maps, which only claim to be improvements on previous bad ones from the author's passing observations. But it is readable and an excellent volume on the Cape Verdes.

MARK JEFFERSON.

LEZZI, ERNESTO. **Alcuni dati sul commercio della Nigeria.** *L'Africa Ital.*, Vol. 35, 1916, No. 2, pp. 33-46. Naples.

—— **Nigeria, Colony & Protectorate of, Blue Book, 1914.** 815 pp. Lagos, 1915. [Sections on meteorology, population, agriculture, transportation, and commerce.]

—— **Sudan Almanac, 1916; compiled in the Intelligence Department, Cairo.** 108 pp., diagrs. London. 5½ x 4.

ASIA

MONGOLIA, CHINESE TURKESTAN, TIBET

GRÖBER, PAUL. **Der südliche Tiën-Schan.** vi and 104 pp., maps, diagrs., ills. *Geogr. Abhandlungen*, herausgegeben von Albrecht Penck, Vol. 10, 1914, No. 1. B. G. Teubner, Leipzig and Berlin.

This monograph treats of a marginal part of the Tian Shan, northeast of Kashgar and adjoining the desert basin of Central Asia. It includes a mountain range, of strong relief, the Kara-Teke-Tagh, but of so complicated form as to elude reduction to a brief statement; a series of aggraded intermont basins next south; and two enclosing monoclinal ranges nearly buried in desert deposits.

Students of geography must wish every success to the daughter science of geology, which in the last century outgrew its old mother; but they may be excused if they at the same time regret to see geology taking the leading part in a "book" where geography has the title rôle. The monograph under review is a case in point. A thoroughgoing geological description of the area studied occupies the first sixty-eight pages, which bear every mark of professional competence; they include without hesitation or excuse an abundance of advanced technical terms, such as *Blattverschiebung, Oberkarbonisch*, and *Fusulina cylindrica;* and they close with nine pages of summary and eight pages of generalizations that seem to demand for their clear understanding about as much thoughtful effort on the part of the geographical reader as their preparation must have required on the part of their geological author, for it is extremely difficult to visualize the special relations of all the items of distribution, structure, and history therein contained. When it comes to geography, only twelve pages are allowed to an account of the orographical features, six to comments on previously published maps, three to precipitation, eight to the age and position of surface forms and to climatic variations (much of the latter topic being geological), and five final pages to lines of travel.

The geological pages are not considered here. An examination of the twelve pages explicitly devoted to orography makes it evident that to their author geographical problems were secondary to geological in the way of home preparation, of field study, and of subsequent presentation. Topographical descriptions are partly placed on the pages devoted to orographical features, partly on those alloted to the age (not stage) of surface forms. The method of description is variable, as is the case in many undisciplined geographical articles today; and this is as if a mineralogist should describe one specimen according to an ancient system of classification and another according to a modern system. Descriptive terms are sometimes empirical, sometimes explanatory. Technical geographical terms are not abundant, and so familiar a one as *Jugendstadium* is placed in quotation marks as if it were something of a stranger. The unwary reader may be puzzled on finding three different terms used for one and the same thing; for a certain range is described on one page as including belts of weak strata, in which *Längstäler* have been excavated, and on other pages the same valleys are called *Nachfolgetäler* and *Isoklinaltäler*. *Inselberg* is not used for a residual mountain in the sense given by Bornhardt and other German writers on Central Africa but for a mountain that is partly buried in superficial deposits. Many structural items, such as the dip of strata, that are essential in understanding orographic features, are omitted from the lines on the geographical pages where they would be helpful. They

may perhaps be announced elsewhere. Sixteen diagrams and sections illustrate the sixty-eight pages of geological text; the location of the sections is unfortunately not shown on the accompanying maps. No diagrams are included in the geographical pages where they are greatly needed; two small landscape sketches are included with the geological sections, but no reference to them is made in the geographical pages. Some good half-tone plates follow the text, but as they bear no reference to the text pages on which they are described, and as few of them are cited in the text, their value is much depreciated. The refolded sheets of maps are of much value, though the style of the text makes reference to the maps laborious.

The reader of this review may wish that it might uncomplainingly tell more of the things described and less of the style of the descriptions. The reviewer's reply must be that he has set forth the chief impressions he has received from several hours' examination of Gröber's monograph. It is so difficult to work over, and digest, and abstract the real geographical essence from pages that are so geologically redundant and geographically unsystematic that the time reasonably allotted to their reading has passed without more geographical product than is here set forth. Reading should be plain sailing, but here it is exploration. Even so elementary an aid to the reader as page headings and frequent paragraph headings are wanting. It would not seem a difficult matter to describe the geographical features of the enclosing monoclinal ranges with their long subsequent valleys, above referred to; but instead of holding to this task and completing it the text too often takes a crossover from a geographical to a geological track in such phrases as "die überschobenen Schollen des oberkarbonischen Kalkes." One intermont basin is briefly described as filled with loess, in which gravelly *wadies* are incised; perhaps that is enough, but if the geographical treatment were on a par with the geological, much more would be said.

Like all the other numbers of Penck's *Geographische Abhandlungen*, this one is a learned and a faithful work and its pages redound to the credit of its author as a geologist; but geographically considered they leave much to be desired. If geology were a struggling young science, one would not begrudge the space here given to its profit; but geology is vigorous and thriving; it is geography that is struggling to become a science. Hence one must regret that the director of a leading geographical institute should divert to another science, already flourishing, so many pages of a leading geographical publication from the needy subject for which he is professionally responsible.

W. M. DAVIS.

—— **Indo-Yarkand Trade.** *Board of Trade Journ.*, No. 1,004, Vol. 92, 1916, pp. 544-546.

VISSIÈRE, A. **Nouvelles divisions politiques de la Mongolie.** *La Géogr.*, Vol. 30, 1914-15, No. 5, pp. 376-379. Paris.

WHITE, J. C. **The world's strangest capital.** Ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 3, pp. 273-295. [Lhasa.]

AUSTRALASIA AND OCEANIA

AUSTRALIA, NEW ZEALAND

MILLS, R. C. **The colonization of Australia (1829-42): The Wakefield experiment in empire building.** xx and 363 pp.; index, bibliogr. Sidgwick & Jackson, Ltd., London, 1915. 9 x 6.

This thesis, "approved for the Degree of Doctor of Science (Economics), in the University of London," is "an account of the Wakefield system of colonization . . . . in its effect upon Australian colonization." Inasmuch as Wakefield's theory was first successfully tried in Canada, a brief account of settlement in this American colony is included. The work of Wakefield is traced from 1829 to the practical completion of his efforts in Australian colonization in 1842.

It seems that England began its colonial expansion with considerable indifference toward the accession of territory and its subsequent settlement and development. Wakefield, whose early life had been marked by about three years' imprisonment, left prison with a determination to accomplish something for the masses and thus remove the cloud over his name. The possibility of securing Australia as a colony without any serious opposition by foreign powers gave him his opportunity. Through his indomitable will, perseverance, and ability to handle men tactfully and shrewdly his manœuvers were crowned with great success.

Some of his keenness is exhibited by the following argument, which he advanced when endeavoring to convince his hearers of the folly of colonizing with men only:— "You may make a colony agreeable to men, but not to women; you cannot make it

agreeable to women without being agreeable to men. You may induce some men of the higher classes to emigrate without inducing the women; but if you succeed with the women you are sure not to fail with the men."

As chief advisor of Lord Durham, Governor-General of the North American Colonies, he put into effect his colonial policy of "responsible government as the best thing for the colony." Apparently this was Durham's policy. Had it been known to the powers in England that it really was Wakefield's, it might not have fared so well. Later, English statesmen agreed "that colonies of a homogeneous character should . . . . be granted responsible government." This represents the culmination of the work of a man who was never allowed to hold public office, yet whose genius could not be supplanted.

A "select bibliography" completes this scholarly and highly illuminating treatment of a difficult subject. EUGENE VAN CLEEF.

MAITLAND, A. G. **The geology of Western Australia.** Map, bibliogr. *Geol. Surv. of Western Australia Bull. No. 64*, pp. 79-91. Perth, 1915. ["Written for the Australian visit of the British Association for the Advancement of Science, 1914, and for a general account of the geology of the mining fields of the state."]

MAITLAND, A. G. **The mining fields of Western Australia.** Maps, diagrs. *Geol. Surv. of Western Australia Bull. No. 64*, pp. 92-105. Perth, 1915.

—— **Queensland, the state of, Statistics of, for the year 1914. Part 1-A: Population.** 13 pp. Govt. Statistician's office, Brisbane, 1915.

TRIVETT, J. B., Government Statistician, comp. **Official Year Book of New South Wales, 1914.** 1,010 pp.; maps, index. [Bureau of Statistics], Government of New South Wales [Sydney], 1915. 10 x 6½. [Sections on "geography," climate, population, mining, commerce, manufacturing, agriculture, irrigation, pastoral and dairying industries, forestry, fisheries, railroads. The geographical section is somewhat of an enumerational nature, describing, one by one, inlets, headlands, islands, rivers, lakes, etc. A map of the land divisions of the state shows the westernmost extension of profitable wheat growing in 1904 and 1912 and the western limit of ten-inch rainfall during the wheat-growing period (April to Oct., inclusive). There are also a map showing mineral deposits and one showing railroads, and a plan of Sydney. This plan, although affecting the appearance of a map, i. e. a representation of features on the ground in their true geometrical relationships, indulges in the reprehensible practice —when not patent—of representing them in bird's-eye view perspective, so that parallel streets are here shown to converge and rectangular blocks appear as rhomboids.]

MELANESIA, MICRONESIA, POLYNESIA

MACCAUGHEY, VAUGHAN. **The forests of the Hawaiian Islands.** Ills. *Plant World*, Vol. 20, 1916, No. 6, pp. 162-166.

The outstanding feature of Hawaiian flora is its endemic character: "there is no other region of equal area in the world that possesses so large a proportion of peculiar and endemic plant species." Classification of the forests rests primarily upon the twofold basis of altitude and exposure. The island peaks rise to heights of 3,000 to 14,000 feet, and the leeward and windward sides are sharply differentiated as regards precipitation. Commercially the most important belt of woodland is that termed "middle forest zone," occupying elevations between 1,800 and 5,000 feet and characterized by the species *ohia* and the "Hawaiian mahogany," *koa*. The introduction of mesquite into the arid lowlands has had important economic results. It affords valuable cattle food and is also used locally as firewood. As a protective covering on the watersheds the native forest is perhaps of the greatest significance.

ANDREWS, E. C. **Relations of coral reefs to crust movements in the Fiji Islands.** Map. *Amer. Journ. of Sci.*, No. 241, Vol. 41, 1916, pp. 135-141.

ELIOT, E. C. **A model protectorate: Gilbert and Ellice Islands, Central Pacific.** *United Empire*, Vol. 6, N. S., 1915, No. 12, pp. 878-882.

LARRISON, G. K. **Water resources of Hawaii, 1913.** 190 pp.; index. *U. S. Geol. Surv. Water-Supply Paper 373.* Washington, 1915.

MAYER, A. G. **Papua, where the stone-age lingers.** Ills. *Scientific Monthly*, Vol. 1, 1915, No. 2, pp. 105-123.

MACCAUGHEY, VAUGHAN. **The woods of Hawaii: Notes on the most important varieties, and their economic value.** Ills. *Scientific American Suppl.*, No. 2098, Vol. 81, 1916, Mar. 18, pp. 184-185. [See, above, review of related paper by same author.]

POWERS, SIDNEY. **Explosive ejectamenta of Kilauea.** Map, ills. *Amer. Journ. of Sci.*, No. 243, Vol. 41, 1916, pp. 227-244.

[—— ***Hawaii, Topographic map of*]: *Honomu sheet.*** 1:62,500. Surveyed in 1911-1912; edition of July, 1915. U. S. Geological Survey, Washington, D. C. [Northeast slope of Hawaii, showing excellent illustration of radial consequent drainage characteristic of slope of a young volcano.—D. W. J.]

[—— ***Hawaii, Topographic map of*]: *Kohala sheet.*** 1:62,500. Surveyed in 1911 and 1913; edition of 1916. U. S. Geological Survey, Washington, D. C. [Northern extremity of Hawaii, showing radial drainage of young volcano and excellent examples of small parasitic cones with craters and crater lakes, apparently aligned upon a single extended NW-SE fissure.—D. W. J.]

[—— ***Hawaii, Topographic map of*]: *Waipio sheet.*** 1:62,500. Surveyed in 1911-1913, edition of 1916. U. S. Geological Survey, Washington, D. C. [Striking representation of wave-cliffed volcano and of young valleys eating into volcano flank by rapid headward erosion. Small deltas have formed at mouths of streams which descend cliff face from hanging valleys resulting from rapid wave erosion. Other streams descend from lateral valleys hanging more than 2,000 feet above flat-floored, open main valleys, an abnormal relation that perhaps may be explained by a partial submergence and filling of main valleys which are in reality young.—D. W. J.]

POLAR REGIONS

ARCTIC

MIKKELSEN, EJNAR. **Notes on the sea-ice along the east coast of Greenland. (Alabama-Ekspeditionen til Nordøst-Grønland, 1909-1912.)** Map. Reprint from *Meddelelser om Grønland*, Vol. 52, pp. 187-213. Copenhagen, 1915.

Co-ordinating his own experience with that of two previous expeditions, Mikkelsen finds that for the eight years 1905 to 1912, excepting 1907, a belt of coast water, from a half mile to four miles wide, extended along the east coast of Greenland, comparatively free from drifting ice in early summer but, in June or July, likely to be filled with ice floes either from the land ice or from the pack ice to the east. He thinks it permissible to infer that, with ordinary ice conditions, this belt of coast water is found in summer from Ile de France (77⅔° N.) in the north to the southern part of eastern Greenland.

This coast water, forming the boundary between the solid land ice and the drifting pack ice, probably marks, at its eastern edge, the western termination of the polar current, as all ice outside the coast water drifts to the south whatever the direction of the wind. Farther north there seems to be proof of the existence of a branch of the main polar current close to the northeastern coast of Greenland; for much driftwood is found in Danmark Fiord, on the coast of Holm and Amdrup Lands, and along the north coast of Germania Land. A part of this current sweeps southward through the channel between Shannon Island and the mainland; and Shannon Island is thus encircled by the polar current, which causes the stretch of open coast water to the south.

On the accompanying map the author shows the average outer limits of the pack ice in the five months April to August, when sealers and others are in those waters; also the régime of the polar current and the Gulf Stream as far as they have been observed.

The predominant winds on the east coast are from the north, and their tendency is to close up the pack ice, especially during the summer; southerly winds as a rule open up the pack ice and set it away from the land. The pack ice has received all the more attention because it has often been difficult for vessels to pass through it to the Greenland coast. Captain Mikkelsen summarizes data concerning it collected since 1894 by the Meteorological Institute of Copenhagen. The pack ice off the east coast has an average breadth of about two hundred miles. It is continually moving from north to south at an average rate of about 6.5 miles a day, with extremes noted of between 23 and 3.2 miles a day. The drift on an ice floe of the *Hansa* crew, after their vessel was crushed in the ice in 1869, was at the rate of only 3.2 miles a day; but a part of this drift was in winter and near the land. Many vessels caught in the pack ice have been carried south from four to five hundred miles.

The pack-ice belt, as shown on the map, is widest in April and narrowest in August. The narrowing of the belt is small between April and May, larger between May and June, greatest between June and July, and smaller between July and August. There is a large body of stationary ice over Belgica Shoal, discovered by the Duke of Orleans expedition of 1905, supposed to be formed by masses of ice that are frozen to the floes and icebergs grounded on the shoal. CYRUS C. ADAMS.

BOUCHTEJEW, A. M. **Les Marées de la Mer Claciale de Sibérie, observées par l'Expedition Polaire Russe en 1900-1903: II.** *Bull. de l'Acad. Impér. des Sci.* [*de Pétrograde*], 1914, No. 13, pp. 889-892. [In Russian.]

HOEL, ADOLF. **D'où vient le renne du Spitsberg?** Ills. *La Géogr.*, Vol. 30, 1914-15, No. 6, pp. 443-448. [Evidence points to a migration of reindeer from Nova Zembla via Franz-Josef Land to Spitzbergen.]

M—, B. W. **The Copper Eskimo.** *Univ. of Pennsylvania Museum Journ.*, Vol. 6, 1915, No. 4, pp. 163-168. [The University of Pennsylvania Museum has recently acquired one of the very few ethnological collections pertaining to the 'copper Eskimo,' the people amongst whom Stefansson encountered the 'blond Eskimo.']

WORLD AS A WHOLE AND LARGER PARTS

ROOSEVELT, THEODORE. **A book-lover's holidays in the open.** xvi and 373 pp.; ills. Charles Scribner's Sons, New York, 1916. $2.00. 8½ x 5½.

He whose field of interest is restricted by the narrow limits of a definition will not care to read this book. But, happily, geography is not a formula. The geographer would do well to know landscapes, to understand the spirit of the many-sided human creatures with whom he deals, to watch the play of forces with which geographic influences interact only occasionally, if he would seek to interpret the earth as the home of man. Geographic literature contains no more vivid description of the Bariloche region of Chile and Argentina than the one on page 145; nor is there a better of the Paraguayan *pantanals*, or marshes, than on page 154. The treatment of the people, whether of Brazil or Argentina or Chile, is sympathetic throughout. To the traveler, Lord Bryce's "South America: Observations and Impressions" and these chapters by Colonel Roosevelt are to be especially recommended. Few other books dealing with South America are at once so delightful, so informing, and so full of the real spirit of the race.

Three of the eleven chapters deal with our western country, three with South America, two with Africa. There is one on bird reserves at the mouth of the Mississippi, one on books, and one on hunting experiences. The preface is superb! In spite of this diversity of contents there is a bond of union in the pioneer quality of all the chapters. Hence also the geographic interest, for it is in the "borderland" that man's responses to nature are perhaps most keenly felt.

We feel sure that the sections on the Navajo and the Hopi need revision. The descriptive portions are most interesting, but special students of both tribes agree in giving the Navajo higher rank. They are independent, virile, well-adapted to a harsh environment, Indians of the best of the old types. The Hopi has learned to lean on the white; the Navajo would starve first. Two recent articles on the subject may serve to extend these brief criticisms (H. E. Gregory: The Navajo Country, *Bull. Amer. Geogr. Soc.*, Aug. and Sept., 1915; The Navajo Indian in Relation to the State, *Rep. of the 31st Ann. Lake Mohonk Conference*, 1913, pp. 64-68).

With moderate revision and the addition of some of the best of the author's hunting stories this book might well become the rival of the classics in hunting and adventure.

—— **Bridges, world's largest and most notable, some of the.** Ills. *Scientific American*, Vol. 113, 1915, Dec. 25, pp. 559-561 and pp. 565 and 567.

CORNISH, VAUGHAN. **The strategic geography of the British Empire (considered in relation to the Central Powers).** *United Empire*, Vol. 7, N. S., 1916, No. 2, pp. 142-160. (Discussion, pp. 153-160.) [Abstracted in the July *Review*, pp. 66-67.]

MCKIE, J. I. **The probable influence of the war on the relations between the mother country and the dominions.** *United Empire*, N. S., Vol. 7, No. 1, pp. 94-101. [This essay was awarded a prize by the Royal Colonial Institute.]

POWELL, E. T. **Empire and money market: The romance of a three hundred years' alliance.** *United Empire*, Vol. 6, N. S., 1915, No. 12, pp. 902-917. [British Empire.]

MATHEMATICAL GEOGRAPHY

SURVEYING AND GEODESY

CARY, E. R. **Geodetic surveying.** ix and 279 pp.; maps, diagrs., ills., index, bibliogr. John Wiley & Sons, Inc., New York, 1916. $2.50. 8⅛ x 5½.

During the past fifteen years marked changes have occurred in the practice of geodetic surveying, and in his condensed textbook the author has confined himself to the best practice of the present day without padding with antiquated methods merely of historic interest. This will be especially appreciated by the man in the field or by the student who

wants results directly. The most recent methods developed by the U. S. Coast and Geodetic Survey are accepted as standard. In order to make the work complete and at the same time more convenient for a shorter course, the author discusses geodetic astronomy and the method of least squares separately in appendices.

The book contains a short introduction and eight chapters. The latter discuss, in order, reconnaissance; base lines; horizontal angles; adjustment of horizontal angles; computation of geodetic latitudes, longitudes, and azimuths; map projections; trigonometric leveling; and precise leveling. Most of these chapters are very brief, but intelligibility has not been sacrificed thereby.

About one third of the book is devoted to two appendices: I, Time, Longitude, Latitude, and Azimuth; and II, the Method of Least Squares. Throughout, the text is supplemented by the solution of numerous problems, and type forms are provided for the reduction of the complicated problems arising in geodetic work. The tables are especially complete for such a small volume. The book is well illustrated and the typography is very good. Numerous references to Government publications and other sources of more detailed information on actual field operations add to the value of the book.

JAMES GORDON STEESE.

HABERMEHL, K. G. **Photography applied to surveying.** 18 pp.; diagrs. Keuffel & Esser Co., New York, 1915. 25 cents. 7 x 5.

The idea of applying photography to surveying is almost as old as photography itself. Compared with the great number of publications dealing with the theory of photogrammetry, its use in actual practice in military and civil topography has been very slight because of the difficulties connected with the working out of the data contained on the plates. Only by tedious methods was it possible to correlate individual points on different photographic plates.

Since 1900 this situation has changed considerably through the development of stereophotogrammetry and Doctor Pulfrich's introduction of the stereocomparator for automatically reducing stereoscopic plates. This little pamphlet serves as an introduction to the subject and gives a chronological review of its principal applications.

JAMES GORDON STEESE.

PHYSICAL GEOGRAPHY

GEOLOGY AND GEOMORPHOLOGY

PIRSSON, L. V., AND CHARLES SCHUCHERT. **A text-book of geology.** x and 1051 pp.; maps, diagrs., ills., index. John Wiley & Sons, Inc., New York, 1915. $4.00. 9½ x 6½.

Part I

The scholarly reputation of the authors guarantees the general accuracy of this book; their experience as teachers lends great weight to their mode of presentation; the imprimatur of a well-known scientific publisher indicates a high grade of printing and illustration. These are some of the reasons why few textbooks of geology can be compared with this one for general excellence. The names of Geikie, Dana, Suess, and Chamberlin nearly exhaust the list. As a product of one of the foremost schools of geology in America it commands special attention.

Moreover, the illustrations are not merely different from but better than those in similar texts; for striking examples see Chapter VIII. The style is clear and direct. Explanations almost invariably proceed from the fundamental principle to a thorough discussion of a particular case. The skill with which Part I is written denotes a broad and deep understanding of student psychology. As a whole, an excellent book which deserves high success.

The following criticisms are offered in a spirit of helpfulness; they are not meant to be merely a catalog of trivial defects. Professor Pirsson says in the preface to Part I "... it commonly happens that the science is presented .... largely from the physiographic side, because this method of approach demands less background in preparation by previous basal studies ....." A better balance ought to be maintained, hence this book. Most critics will agree to this; certainly the reviewer does. Physical geology is not alone physiography.

But the physiography of this book is not only greatly diminished in volume; it is not of good quality. The section on ocean currents (pp. 84-85) begins with an explanation but wanders off into that empiricism which apparently exhibits lack of knowledge. Both undergraduate and graduate students of geology are in general profoundly ignorant of wind systems and ocean currents. The chief reason for so serious a shortcoming lies in

a widespread belief that a grammar-school knowledge of climate is all that a doctorate requires. Probably the next great advance in geology will be made when a thorough knowledge of physiography and especially climate is widely applied to the problems of geologic structure and history, as in Barrell's recent papers (e. g. Relations between Climate and Terrestrial Deposits, *Journ. of Geol.*, Vol. 16, 1908, p. 159 ff.). It is delaying that advance to give so little on either subject in what is otherwise a first-class book. After all, the best textbooks are those that serve the geology of the future as well as that of the present.

The section on *youth* and *maturity*, page 65, is the elementary physiography of twenty years ago. It confuses topographic youth and the youth of streams (see D. W. Johnson: Youth, Maturity, and Old Age of Topographic Forms, *Bull. Amer. Geogr. Soc.*, Vol. 37, 1905, pp. 648-653). The same might be said of the caution on page 376 regarding even summits as a poor guide to peneplanation. Only a few feeble amateurs still make so loose an interpretation as the one which the author condemns. The caution is labored and the conclusion wrong that "accordance of summit levels is what we should expect, not the reverse." The idea of expectable accordance is obviously based on Daly (The Accordance of Summit Levels Among Alpine Mountains, *Journ. of Geol.*, Vol. 13, 1905, pp. 105-125), but, since that time, *proof* has multiplied that Daly's conclusion, even if true, is applicable to a very small portion of the peneplaned surfaces of today. The section on page 350 is grammar-school, not college geography. Unfortunately it is what some geologists regard as serious and even advanced physiography. Modern physiographers and their work receive practically no attention. Neither Davis nor Salisbury is mentioned, save where the former is credited, on page 375, with introducing the word "monadnock"; which is almost like writing a book on geology and using Dana's name once to say that he employed the word "lagoon" in developing a theory about coral reefs. In view of these illustrations we should hardly expect to find a good physiographic map of the United States. In Figure 203 there is in many cases such total disregard of even the primary lines of relief as to make the map crude to the point of condemnation. The apology for the map in the title beneath it does not relieve the situation. On a par with it is the map of past glaciations, Figure 511, an inheritance from the maps of the past. The last few years have supplied data for a much better result. The improved map by Martin ("Physical Geography of Wisconsin," *Wisconsin Geol. Surv. Bull. No. 36*, 1916) should furnish a clue to the authors in their next edition.

The reader should now reread the first two paragraphs of this review. I. B.

Part II

The materials assembled by Professor Schuchert in the section on historical geology present an unusually satisfactory statement of all phases of this subject. In the aspects of the problem relating to purely physical history the author has given us an excellent summary of available knowledge in concise form. The history of geographic features, the relation of this side of historical study to that concerned with crustal movement and its causes, and the significance of geographic change in terms of influence upon biologic history have naturally been given an important place, though not unduly emphasized. It is not an overestimate to state that this work offers the best summary of studies on the geographic aspects of historical geology that has appeared up to this time.

Professor Schuchert's long experience as a paleontologist, the range of his personal activities, extending over the study of a large portion of the invertebrate group, and including even some of the vertebrates, have made it possible for him to give us a review of paleontologic history covering the field without undue emphasis on details. The method of separating important biologic groups for discussion at special stages in the development of the subject seems to the reviewer eminently satisfactory.

From the point of view of the instructor, the arrangement of material in this work is excellent. The illustrations are clear and well chosen. Perhaps the highest compliment that can be paid to the work is that it has met with unusual favor in actual class work on historical geology and seems to fill a distinct need in courses for undergraduates entering upon the study of this subject. JOHN C. MERRIAM.

BAKER, H. B. **Origin of continental forms, V.** *Sixteenth Rept. of the Michigan Acad. of Sci.*, pp. 99-103. Lansing, 1914.

BERG, ALFRED. **Geologie für Jedermann: Eine Einführung in die Geologie, gegründet auf Beobachtungen im Freien.** (Series: Der Naturforscher.) 259 pp.; diagrs., ills., index, bibliogr. Theod. Thomas Verlag, Leipzig [1912]. M. 3.75. 8½ x 5. [A helpful manual of practical observation. In the section on topographic maps the figure which appears on the back of every U. S. Geological Survey topographic

sheet showing a perspective view and a contour-map of the same region is closely imitated, without credit.]

BIASUTTI, R. **Sulla nomenclatura relativa ai fenomeni carsici.** *Riv. Geogr. Italiana*, Vol. 23, 1916, No. 1, pp. 45-55.

GALITZIN, B. **The determination of the epicentre of an earthquake from two observed azimuths.** Diagrs. *Bull. de l'Acad. Impér. des Sci.* [*de Pétrograd*], 1914, No. 15, pp. 1137-1156.

VAUGHAN, T. W. **The present status of the investigation of the origin of barrier coral reefs.** *Amer. Journ. of Sci.*, No. 241, Vol. 41, 1916, pp. 131-135. ["A preface to 'Relations of Coral Reefs to Crust Movement in the Fiji Islands,' by E. C. Andrews," listed above, under "Melanesia, Micronesia, and Polynesia."]

PHYTOGEOGRAPHY AND ZOÖGEOGRAPHY

HESSE, RICHARD, AND FRANZ DOFLEIN. **Tierbau und Tierleben in ihrem Zusammenhang betrachtet.** Ills., index. **Vol. 1: R. HESSE. Der Tierkörper als selbstständiger Organismus.** xvii and 798 pp. **Vol. 2: F. DOFLEIN. Das Tier als Glied des Naturganzen.** xv and 960 pp. B. G. Teubner, Leipzig, 1914. Mk. 20 for 2 vols. 11 x 8.

This work in two volumes gives a very detailed account of the structure, habits, physiology, adaptations, life histories, and inheritance among animals. The second volume is the most interesting of the two from the standpoint of ecology and animal distribution. It takes up quite adequately the effect of food supply, enemies, sexual characters, migrations, development of community life, symbiotic relations, parasitism, and the resulting specialized adaptations.

The authors take up the cyclic growth of such animals as the mollusks, the various media in which animals live, the chemical composition of these media, and the general effects of changes in media, temperature, and climate in causing variations.

It is impossible to do justice to the completeness and detail given in this publication within the limits of a review. Briefly, the work is a masterpiece, both in detail of description, information, and illustration. Although especially adapted for the college library, yet these books would be a splendid addition to the library of any serious student of animal life. They contain little that is new, and yet the manner of presentation and the illustrations given are fresh, most interesting, and many of them original.

R. W. SHARPE.

BAKER, H. B. **Physiographic and molluscan succession in lake pools.** Maps. *Sixteenth Rept. of the Michigan Acad. of Sci.*, pp. 18-45. Lansing, 1914. ["The problem under consideration is the physiographic succession in beach pools, which are formed along the shores of larger lakes by wind and current action, and the corresponding ecological succession in the molluscs they contain."]

BRIGGS, L. J., AND H. L. SHANTZ. **Hourly transpiration rate on clear days as determined by cyclic environmental factors.** Diagrs., bibliogr. Reprint from *Journ. of Agric. Research*, Vol. 5, 1916, No. 14, pp. 583-650. U. S. Dept. of Agric., Washington, D. C.

KRYLOV, P. N. **Sur l'oscillation de la limite entre les régions des forêts et des steppes.** *Bull. de l'Acad. Impér. des Sci.* [*de Pétrograd*], 1914, No. 16, pp. 1161-1177. [In Russian.]

MOORE, BARRINGTON. **Notes on succession from pine to oak.** *Botanical Gaz.*, Vol. 61, 1916, No. 1, pp. 59-66. [The view, supported by Cowles's work in the Great Lakes region, that regards the pine as representing an earlier stage in the evolution from a simpler to a more complex floristic association has been somewhat modified by Taylor's investigations on the pine barrens of New Jersey. An unquantitative examination of the pine-oak distribution of a small area on the outwash plains of Hempstead, L. I., confirms the complex nature of the problem and suggests possibilities for detail research.]

SAMPSON, A. W. **Natural revegetation of range lands based upon growth requirements and life history of the vegetation.** Ills. *Journ. Agric. Research*, Vol. 3, 1914, pp. 93-148. U. S. Dept. of Agric., Washington, D. C. [Reviewed by H. L. Shantz in *The Plant World*, Vol. 20, 1916, No. 6, pp. 167-169; whence entry is taken.]

HUMAN GEOGRAPHY

Economic Geography

Distribution

Pratt, E. A. **The rise of rail-power in war and conquest, 1833-1914.** xii and 405 pp.; index, bibliogr. P. S. King & Son, Ltd., London, 1915. 7s. 6d. 9 x 5½.

Very early in the history of steam railway development the advantages of this improved system of transportation for purposes of warfare was a matter of serious consideration. In 1833, the building of railways with a view to their use for strategical purposes was discussed in Germany. In 1842, a comprehensive system of such lines, usable in both peace and war, was under construction. The same year this fact was pointed out in the French Chamber, viz., that Germany already was building, in the direction of France, a system of "aggressive lines" which was a part of a larger system of railways which would enable war to be conducted against France and Russia at the same time. It remained, however, for the American Civil War to inaugurate a really scientific use of railways for military purposes. "Many of the problems connected therewith were either started in the United States or were actually worked out there, precedents being established and examples being set which the rest of the world had simply to follow, adapt, or perfect." For instance, there is traceable to the time of our Civil War the use of armored trains, the ambulance or hospital train, the creation of a special corps to build, destroy, or operate railways, the problem of conducting warfare far from the base of supplies by means, if necessary, of a single-track system of railways, to say nothing of other equally as important problems which even in the present war are matters of great moment.

In showing the modern application of military tactics to railway systems, the countries selected were Germany, France, and England; while practical illustrations are given by an impressive description of the military uses of railways in the Crimean, Franco-German, Russo-Turkish, Russo-Japanese, and Boer Wars. Finally, as an appropriate culmination of his description of the evolution, in numerous countries, of rail-power in warfare, the author presents a series of generalizations and theoretical conclusions under four heads, viz., advantages of a railway system capable of meeting the requirements of the military situation; conditions essential for efficiency; limitations to the usefulness of railways in time of war; drawbacks and disadvantages.

The book is one which should appeal primarily to the student of military history, although, in view of the present-day widespread interest in military matters, it cannot fail to hold the attention of the general reader. It contains no inconsiderable amount of grist for the geographer's mill. A. L. Bishop.

Aspe-Fleurimont, —, and Henri Chevalier. **Un programme de réformes économiques: Transports par fer, par eau, par mer.** *Bull. Soc. de Géogr. Commerc. de Paris*, Vol. 38, 1916, No. 1-2-3, pp. 12-38.

—— **Ships, Re-filling the sea with.** Ills. *Dun's Rev., Internatl. Edit.*, 1916, May, pp. 47-50. [On the present shipbuilding activity, which is not able to fill the demand. One of the anomalous conditions created by the war is strikingly illustrated in a view showing a full-rigged sailing vessel moored to a New York dock with sky-scrapers in the background.]

—— **Telephone, Voice voyages by the National Geographic Society: A tribute to the geographical achievements of the.** Map, ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 3, pp. 296-236.

HISTORY OF GEOGRAPHY AND EXPLORATION

Baratta, M. **L'opera scientifica di Giuseppe Mercalli.** Ills. *Boll. Soc. Geol. Italiana*, Vol. 34, 1915, No. 2, pp. 343-419. Rome. [Prominent Italian vulcanologist, late director of the Vesuvius observatory.]

Hutcheon, J. **Geography: Its field, its fascination, and its future, with special reference to South Africa.** *Journ. Manchester Geogr. Soc.*, Vol. 30, 1914, Pts. 3 and 4, pp. 145-153.

Kerr, J. G. **Sir John Murray: Obituary notice.** *Proc. Royal Soc. of Edinburgh*, Vol. 35, 1914-15, Part 3, pp. 305-317. [Bibliography, pp. 313-317. See also item below, under S[—], A. E.]

McF[arlane], J. **Geography at the British Association.** *Geogr. Journ.*, Vol. 46, 1915, No. 5, pp. 374-380. [Contains abstracts of the papers read at the meeting.]

S[—], A. E. **Sir John Murray, K.C.B., 1841-1914.** *Proc. of the Royal Soc.*, Series B, Vol. 89, 1916, No. 612, pp. vi-xv. [See also item above under Kerr, J. G.]